Nutrition and Health Behaviors Survey
Ichilo Province
Santa Cruz, Bolivia
April 3- May 15 2000

Gwen O'Donnell, MA, MHS
International Eye Foundation
7801 Norfolk Ave. Suite 200
Bethesda, MD 20814
Tel: (301) 986-1830 x19
Godonnell@iefusa.org

TABLE OF CONTENTS

Executive Summary

IEF/CEPAC conducted a baseline nutritional survey in Ichilo Province, Santa Cruz, Bolivia. Preliminary qualitative work for the survey started in late March and suvey training took place in the first week of April. Survey implementation started the second week of April, and ended in mid May of 2001. In total 600 homes were visited, chosen at random from a 30-cluster sampling methodology. Taking five weeks to complete, the survey involved three teams of three people: a supervisor, an interviewer and a clinical person. Each team visited 20 homes per cluster. The purpose of the survey was to generate baseline data that will be used to develop an effective nutrition intervention as part of IEF/CEPAC's child survival project in Ichilo Province.

The survey had both qualitative and quantitative components. The quantitative component consisted of a biochemical analysis of mothers' hemoglobin concentration to detect iron deficiency anemia (IDA). Children under five were analyzed for IDA, vitamin A deficiency, and protein energy malnutrition (PEM). A Hemocue machine measured hemoglobin concentration, a dried bloodspot retinol indicator measured vitamin A deficiency, and anthropometric measurements (weight-for-height, weight-for-age, and height-for-age z-scores) measured PEM. A sub-sample of caretakers and children also gave feces samples to be analyzed for worm eggs, larvae, protozoan trophozoites, and cysts.

The qualitative component of the survey consisted of focus groups. The objective of the focus groups was to assess knowledge and beliefs about nutrition, understand health seeking and feeding behaviors around illness (particularly diarrhea and pneumonia), and to determine relevant family and community structures. Mothers (urban and rural), community health workers (RPSs), and health worker personnel (e.g. doctors, nurses, and other relevant health people) participated.

The following highlights, along with the rest of the survey results, will be used to design a nutrition intervention in Ichilo Province. The DBS methodology used made it difficult to precisely determine the degree and potential causes of VAD in Ichilo Province. Nonetheless, mean serum retinol concentrations are likely to fall between 19 and 22 mcg/dL, suggesting that regardless of DBS quality, nearly half the population is likely to fall close to or below the currently accepted cutoff for vitamin A sufficiency of 20 mcg/dL.

Parasites were very common among women and children: approximately 62% of children and 75% of mothers had one or more types of parasites. Among children, parasitic infection became more common with increasing age ($p < 0.001$). Children were more likely to have parasites if their mother did ($p = 0.03$). The degrees of trichuris (pinworm) and uncinarias (hookworm) burden were related to the iron status of anemic women (i.e. 40% of mothers). Pinworm prevalence was relatively rare, found in 6% of children and 7% of mothers. Hookworm, however, was found in 16% of children and 26.8% of mothers. These worms may be the most likely parasites to adversely affect iron status in both mothers and children.

Overall, 41.7% of children were anemic. In adjusted analyses, the odds of being anemic were approximately 1.5 times greater among boys compared to girls ($p < 0.05$), and anemia was a particular problem between 6 months and 3 and-a-half years of age. Using a field to defecate was highly predictive of anemia, with the odds of being anemic nearly 7 times greater among children who defecated outdoors compared to those who used a latrine ($p < 0.001$). Children whose families had animals available for both consumption and sale were half as likely to be anemic ($p = 0.005$). Stunting was also significantly related to the presence of anemia in children ($p=0.007$).

The majority of women, 88.8%, reported ever breastfeeding, with 59% reporting initiating breastfeeding within an hour of birth. Over 50% of women reported exclusively breastfeeding until between 3 and 6 months of age. The average age of weaning reported (question 51) was 14.6 ± 6.9 months, ranging from 0.2 to 51 months.

An examination of the distributions of the anthropometric measures shows that the majority of children had appropriate weight for age ($\geq$ -1 Z-score), although over 30% were underweight for their age ($<$ -1 Z-score). The majority of children were short for their age but had appropriate weight given their height. As expected, wasting in the population was rare, but stunting was common. Age was a dramatic contributor to rates of stunting, and socioeconomic variables suggest that poverty may also impact stunting.

Introduction
The International Eye Foundation (IEF) is currently implementing a four-year child survival project in Ichilo Province, Santa Cruz, with its local Bolivian partner, el Centro de Promoción Agropecuaria Campesina (CEPAC). The overall goal of the project is to improve CEPAC's delivery of child survival interventions by improving coverage and quality of individual interventions. The project focuses on five interventions, namely EPI (Expanded Immunization Program), nutrition (including micronutrients and vitamin A), breastfeeding, diarrheal disease management, and pneumonia case management. Fifty percent of the project's effort is focused on the nutrition intervention (including breastfeeding and micronutrients), 20 percent on EPI, and 15 percent each to the diarrhea and pneumonia interventions.

As for the program location, Ichilo Province consists of three different areas: Buena Vista, Yapacani, and San Carlos. The total population is approximately 62,153 (based on 1997 PPD-Participatory Development Plan- figures and a 1.83% annual growth rate). A total of 210 communities exist in Ichilo Province: 110 in Yapacani; 55 in Buena Vista; and 45 in San Carlos. It is estimated that 9300 children under five years-of-age live within the three areas of Ichilo Province. The leading causes of death for these children are malnutrition, pneumonia, and diarrhea. Lack of proper nutrition is also associated with maternal death.[1] The current health system in the project area is facility-based with only limited outreach capabilities. CEPAC uses three mobile units for outreach and emergency transportation of seriously ill patients, each unit visiting one community per day. A nurse and two health workers staff the vehicles.

The purpose of conducting a nutrition survey in Ichilo Province was to assess levels of vitamin A (VA) and iron deficiency in mothers and children, as well as actual levels of malnutrition (Ministry of Health- MOH- data is inconsistent). In 1998, the MOH reported that 1231 of 2952 children (41.7%) under the age of two in Ichilo Province were moderately malnourished, or worse, based on weight-for-height. Other data from 1999, also obtained from the MOH, shows similar, although slightly better, measures of malnutrition. Overall, rates of malnutrition reported by MOH seem unreasonably high. According to DHS reports, the Department of Santa Cruz generally performs well with regard to nutritional status compared to other departments. Having malnutrition rates within Santa Cruz that are double those of other provinces therefore seems suspect. In short, current MOH data *may* overestimate the prevalence of malnutrition in some provinces.

Aside from malnutrition, iron and VA deficiency are severe problems in the project area. National data reports that about 50% of women have iron deficiency anemia. Oral reports from CEPAC at the writing of the DIP suggest that this figure was greater than 90% in rural areas and slightly lower in urban areas.
CEPAC reported that 100% of pregnant women in their target communities annually receive iron tablets, but the data is not distinguishable between pre and post-natal supplementation, nor is there information on compliance. Nightblindness has been anecdotally reported in the area, a strong indication that there is a severe VA problem, although no national or provincial data on vitamin A deficiency exists. According to the KPC, 63% of children less than two years old had eaten a VA rich food in the last 7 days in Ichilo Province. Only about 20% of children under two, however, had received a VA capsule in the six months prior to the KPC survey.

---

[1] Academy for Educational Development: The Linkages Project. 2000. <u>Maternal Nutrition: Issues and Interventions</u>. AED,
 Washington, DC; Pg. 5.

Nutrition

Good human nutrition is essential for a society's social and economic development, enabling the acquisition of human capital, technological advances, production expansion, and the ability to compete at an international level. Poor populations lacking access to good nutrition face serious developmental handicaps as malnutrition and disease are synergistic; the more malnourished a person is, the weaker is her immune system and the more susceptible to disease she will be. Disease often decreases appetite, hence nutrient intake, along with nutrient absorption and utilization. In short, malnutrition invites disease and disease reinforces malnutrition. Deficiencies in vitamin A, iron, and iodine are especially damaging, and are linked with high levels of infant mortality and/or crippling disabilities.[2] Low intake of essential nutrients and/or an inability to properly absorb nutrients are the principal cause of micronutrient deficiencies. A high incidence of measles, diarrhea, and parasitic infections, along with inadequate breastfeeding practices also contribute to widespread micronutrient deficiencies.

Macronutrient (protein, carbohydrate, fat) deficiencies are also a major problem in Latin America, including Bolivia. Protein deficiency, otherwise known as protein-energy malnutrition (PEM), is the most significant type of malnutrition and usually complements vitamin A deficiency disorders. PEM differs from micronutrient deficiencies as it often correlates with an overall inadequate food intake, rather than simply inadequate protein consumption. In Latin America, and other parts of the developing world, micro- and macronutrient deficiencies frequently complement each other. Protein is necessary for the manufacture of red blood cells and hemoglobin, vessels that transport oxygen within red blood cells. A lack of protein causes kwashiorkor, often characterized by edema, and nutritional marasmus, or severe physical wasting.[3] Both kwashiorkor and marasmus have high fatality rates. Protein deficiency, especially during the first few months of life, will also retard myelinization and brain maturation, adversely affecting intelligence and other cranial functions.[4] This results in a reduced ability to learn new concepts, solve problems, and think logically. If a diet rich in animal or fish proteins is prohibitively expensive for the poor, protein-rich foods of vegetable origin should be consumed. For example, the consumption of legumes such as groundnuts, beans and cowpeas, along with certain cereal proteins, will provide adequate amounts of protein, especially if eaten during the same meal.[5] Reducing PEM, especially in early childhood, not only helps to improve a society's human development, but also helps to save lives.

Vitamin A deficiency (VAD) also threatens the lives of many: approximately 250 million people worldwide. Preventing VAD would lower childhood mortality rates by up to 30 percent.[6] VAD is the primary cause of xerophthalmia, resulting in blindness, and it increases susceptibility to certain

---

[2] Iodine deficiency was not studied in this survey due to the fact that iodine deficiency disorders (IDDs) do not present a
severe threat to the health of Bolivians. This is largely due to efforts over the past ten years to iodize salt in Bolivia.

[3] Edema is a collection of water in the body from diseases that block the draining of extra cellular fluid. Kwashiorkor and wet
beriberi are two major deficiency diseases that cause edema. Electrolyte disturbances may be the root cause of the excess
water accumulation. A person can have edema and still be dehydrated (from diarrhea, for example). (FAO, 84)

[4] Montague, J. 1973. "Protein Deficiency in Early Life," JAMA. Vol. 3 (14); Pg. 1321.

[5] Food and Agriculture Organization (FAO) of the United Nations. 1997. Human Nutrition in the Developing World.
FAO, Rome; Pg. 143.

[6] OMNI (Opportunities for Micronutrient Interventions). 1997. Micronutrient Malnutrition Facts: Technical Series. Fact
Sheet 1. USAID/JSI (John Snow, Inc.), Washington, DC; Pg. 1.

cancers, parasitic diseases, and infectious diseases.[7]   Measles, for example, will accelerate xerophthalmia due to the fact that it leads to a reduced consumption of food and a greater metabolic demand for vitamin A. Estimates suggest between 250,000 and 500,000 preschool children go blind each year due to poor intake and/or absorption of vitamin A.   The prevalence of xerophthalmia in children is predominately among those living in impoverished conditions. It is highly unusual to find xerophthalmia among wealthy families, even in areas with a high incidence of the disease. Xerophthalmia is associated with low socio-economic status, female illiteracy, inequality, malnutrition, scarcity of land, lack of access to curative and preventive primary health care, and a high incidence of infectious and parasitic diseases (frequently caused by unsanitary living conditions).[8] It is also associated with protein-energy malnutrition (PEM). In Brazil alone, vitamin A deficiencies cost the economy an estimated US $23 million per year.[9] (Similar cost-analysis figures are not available for Bolivia.)

Sources of vitamin A include liver, fish-liver oils, egg yolks, dairy products, and carotene-rich fruits and vegetables. For the majority of poor people in Latin America and other developing countries, 80 percent or more of their intake of vitamin A comes from carotene in foods of vegetable origin.[10] Carotenes can be found in many green and yellow vegetables and fruits, as well as in yellow maize and yellow root crops, such as sweet potatoes. For a variety of market and cultural reasons, such vegetables are not frequently consumed in Bolivia.

Worldwide, iron deficiency anemia (IDA) affects 60 percent of women in non-industrialized countries, and 12-18 percent of women in North America, Europe, and Asia. IDA is the most widespread human nutritional problem in the world. Iron is essential for the construction of hemoglobin in red blood cells. A lack of iron results in the production of small, deformed cells with an abnormally low supply of hemoglobin. The clinical symptoms of IDA include fatigue, lethargy, breathlessness after modest activity, dizziness and/or headaches, palpitations with discomfort or unease, paleness of mucous membranes, and edema in certain cases.[11] The danger of premature birth, low birth weight, and maternal death for pregnant women greatly increases with IDA, resulting in as many as one in five maternal deaths.[12] In children and infants, IDA causes cognitive deficiencies and poorer learning abilities, along with behavioral abnormalities. In adults, IDA decreases the capacity for physical work and worsens appetite. According to USAID, IDA affects 26 percent of Latin Americans. The breakdown according to age group is as follows: 50 percent of 0-4 year-olds, 26 percent of 5-12 year-olds, 13 percent of men, and 32 percent of pregnant women.[13]

Iron deficiency is often the result of a lack of a sufficient quantity of iron in the diet, however some people suffer from anemia even though their intake is close to recommended allowances. This is due to the fact that human intestines absorb certain forms of iron better than others. People have the capacity to absorb only 10 percent of the total iron they ingest, which is complicated by the fact that

---

[7] Xerophthalmia, a consequence of VAD, consists of eye lesions and cornea ruptures, resulting in blindness.
[8] FAO, 170.
[9] UNICEF. 1998. Food Fortification in Brazil: Investing in Health and Nutrition. A discussion paper. Brasilia, Brazil;
    Pg. 2.
[10] IBID., 170.
[11] FAO., 151.
[12] IBID., 151.
[13] IBID., 147

the content of iron in foods varies greatly.[14] Traditionally, reliable dietary sources of iron include animal products consisting of haem iron (such as liver, red meat and blood products), and vegetable products composed of non-haem iron (such as pulses, dark green leafy vegetables, and millet). Iron absorption is either enhanced or hindered depending on the other nutrients in an individual's diet as well as his/her physical condition. For example, hookworm infections, very common in tropical climates such as Santa Cruz, Bolivia, impede iron absorption. Conversely, vitamin C enhances iron absorption. Overall, the likelihood of developing anemia revolves around the type and form of iron consumed, an individual's absorption ability, the quantity of iron losses, and general medical status.

Micronutrient deficiencies and malnutrition remain a problem in Bolivia. In relation to other departments within Bolivia, Santa Cruz has shown progress in an effort to lower malnutrition rates during the past ten years, particularly "global malnutrition" based on the weight-for-age indicator. In their annual micronutrient report (2000), however, the Ministry of Health suggests that national nutrition indicators, notably those of Santa Cruz, fail to capture what they call "hidden hunger." This is due to the following factors:

a. population increases
b. substantial migration of interior populations to Santa Cruz
c. pockets of poverty that have expanded in many zones and are already considered problematic
d. decreased employment opportunities, resulting in increased social depression
e. insufficient and inadequate nutrient intake, according to age and life stage
f. failure of health services to take and promote measures to prevent malnutrition
g. lack of compliance to recommended breastfeeding and complimentary feeding practices
h. micronutrient deficiencies (most notably vitamin A, iron, iodine, and others)
i. frequent infections, such as diarrhea and pneumonia
j. consumption of contaminated water

Migration is deemed as one of the most influential reasons for shifting nutrition indicators. In the department as a whole, malnutrition rates have remained somewhat constant, however specific areas have shown dramatic changes. Looking specifically at Ichilo Province, MOH data demonstrates that moderate malnutrition rates (-2 Standard Deviations) have increased among children less than 5 years-of-age in rural areas, rising from 5.28% in 1997 to 6.21% in 2000. It is highly probable that many of the factors listed above are responsible for this change.

Survey Methodology
The first step undertaken in the survey consisted of conducting 12 focus groups. Four focus groups were held in each area- Yapacani, San Carlos, and Buena Vista. Health workers, rural mothers, urban mothers, and health center personnel, respectively, participated. Approximately 7-10 people took part in each group. The purpose of the focus groups was to explore knowledge/beliefs about social structure and child feeding practices. More specifically, the lines of communication in communities, as well as within families, were investigated. Within families, questions such as who filled the 'head of the household' and primary childcare provider roles, as well as how many children under five years-of-age were addressed. Community concerns about nutritional status, health priorities, as well as knowledge of nutritional status were also assessed.

---

[14] IBID., 151.

Focus group participants were asked about vitamin A deficiency, specifically to define it, to describe any community members who might have it (particularly those with nightblindness), as well as identify any women who had nightblindness during pregnancy. A local term for nightblindness was sought, however none exists in Santa Cruz. Questions also focused on breastfeeding practices, weaning, and complimentary feeding. Food prohibitions/taboos were discussed, especially during pregnancy, lactation, and illness. Current dietary practices were also explored, such as the number of meals children eat per day, the definition of a snack vs. a meal, and how many snacks are consumed on a daily basis. Decision-making about food purchases and food preparation were also considered.

Focus groups also discussed the relationship between diet and age. In other words, participants were asked to describe what were appropriate meals for infants, toddlers, preschool age children, pregnant women, lactating mothers, non-lactating mothers, and non-pregnant women. They were also asked to describe problems encountered when feeding children, whether or not they encourage their children to eat, and how they would rate the overall appetite of child. Food-specific questions focused on the access and consumption patterns of foods rich in protein, vitamin A, and iron. The seasonal availability of foods was also addressed, as was the question of how and where foods were acquired. Participants were also asked to identify and describe "special foods" that relate to illness, holidays, etc. Participants shared their knowledge of vitamins/supplements and how they identified nutritional deficiencies. Parasites (definition, identification, etc.) were also discussed, as were health-seeking behavior and basic hygiene/sanitation practices.

Focus group guides and questions were developed in an effort to generate the information necessary to design a questionnaire for caretakers of children under five years-of-age. The questionnaire was written in Spanish and revised upon receiving reviewer comments. It included many questions that were similar to those in the focus groups, but also incorporated more caretaker, current child health, and socio-economic questions. It also had more specific questions about the types of vitamin A and iron rich foods consumed by the child on a daily basis. On average, each household visit lasted 40 minutes: 20 minutes to complete the questionnaire and 20 minutes to complete the clinical/anthropometric work.

Sample size calculations demonstrated that to achieve vitamin A and iron deficiency results within a 6% precision rate, 600 households would have to be visited. Thus, thirty clusters of 20 households were randomly chosen through a series of steps. First, the total number of inhabitants in the survey area was divided by the selected number of clusters (i.e. 30), and the mean number of inhabitants calculated. Reading the last four digits of a serial number from a Bolivian dollar bill provided a random number below the calculated mean. Adding this number to the mean generated a series of thirty random numbers. The communities to be surveyed were then identified by matching the random numbers with the cumulative population. In other words, random numbers were matched with communities that had an equal or lesser number of inhabitants. Identifying households in the communities also followed a random methodology. Arriving at a community, team members located the center of the town and spun a bottle to ascertain in which direction they should proceed. They then advanced to the first house they came across and asked whether children under five years-of-age lived there. If children under five were present, they conducted the survey. They then proceeded to the next closest house and began anew. In households with more than one child under five years-of-age, the team assigned the children numbers and randomly selected one. If more than one family lived in the same house and ate from the same kitchen, one family was selected at

random. However, if each family separately prepared and ate their food, the team invited each to participate.

The three survey teams consisted of three individuals: a supervisor, an interviewer, and a clinical person. The team members were recruited by word-of-mouth through CEPAC staff in Yapacani, Buena Vista, and San Carlos. They were interviewed by CEPAC's Director of Health, Dr. Oswaldo Chavez, and IEF's Child Survival Coordinator and Nutrition Survey Director, Gwen O'Donnell. Five men and four women were hired based on their qualifications including, health or health-related experience, Quechua-speaking ability, clinical skills, previous survey experience, level of education, and personal/professional recommendations. Each individual received training for the supervisor, interviewer, and clinical positions to ensure quality control and crisis management systems within each survey team. The training relied on significant individual participation and lasted five days. Core issues covered in the training included the importance of vitamin A and iron, the consequences of vitamin A and iron deficiency, the survey methodology & protocol, the questionnaire, team member roles & responsibilities, and how to properly take anthropometric measurements, do finger pricks, use a hemocue machine, and prepare dried blood spots. The Nutrition Survey Director conducted the training with help from certain CEPAC staff, namely Dr. Mabel Morales, Ms. Miriam Milluni, and Ms. Femida Gutierrez. Additionally, Mr. Howard Jackson of Craft Technologies traveled to Bolivia to participate in two days of the training, namely how to properly do finger pricks and prepare dried blood spots.

During the training, team members reviewed the questionnaire in detail to ensure that they understood exactly what was being asked and the data that they needed to collect. Survey questions included topics such as socio-economic status, basic sanitary/hygiene practices, child feeding patterns, current status of child health, mothers' knowledge of vitamin A and iron, mothers' and childrens' eye problems, and others (refer to appendix 3). A simple consumption frequency of vitamin A and iron-rich foods was also included, relying on three different serving bowls. If a caretaker responded that her child had eaten mango in the last week, for example, she was asked to indicate what size portion the child had eaten, as well as how many days the child had eaten it.

Training on anthropomentric measurements started with a review of the significance and importance of height-for-age, weight-for-height, and weight-for-age, as well as mid upper arm circumference (MUAC) measurements. A practicum ensued starting with a demonstration of how to use the model 881 scale. Purchased from Shorr Productions, the scale was designed for fieldwork, specifically for facilitating the weighing of young children and infants. A mother stands on the scale and her infant is passed to her. With the press of a button, the scale automatically subtracts the weight of the mother, leaving the child's weight on the display. Team members then practiced using Shorr Boards to measure children's height or recumbent length. Following the standard protocol, children less than one year of age were measured laying down (i.e. recumbent length), whereas children 1-5 years-of-age were measured standing up. Team members also practiced taking MUAC measurements after a demonstration, following the standard protocol. Two team members measured an arm from the top of the shoulder to the elbow to find the midpoint, marked the midpoint, and then measured and recorded the arm cirucumference using a MUAC tape. The measurement was then repeated to ensure accuracy and precision. For each measurement in fact (weight, height, MUAC), two separate readings were taken to ensure accuracy and precision.

Dickenson lancets were used to perform the fingerpricks. These lancets were chosen because they are believed to be the least painful, and they decrease the "scare factor" due to the fact that the

needle is hidden in the lancet. Team members practiced on each other after several demonstrations on proper finger-sticking technique. The first step was to have the patient shake their hands and/or do large extended arm circles to increase blood circulation to the hand. The clinical person then made sure that the patient was sitting comfortably and that the hand was warm and relaxed. Wearing gloves, the clinical person massaged the hand gently, pushing blood into the middle finger with downward strokes. Using his/her thumb, he/she lightly pressed the finger from the top of the knuckle to the tip, further stimulating blood flow. He/she then cleaned the finger with alcohol and dried it. After gently pricking the side of the fingertip, the clinical person wiped away the first two drops of blood. By capillary action, a hemocue cuvette then sucked up *one* large drop of blood. Any excess blood was wiped off the cuvette and it was inserted into the portable Hemocue machine to measure hemoglobin concentration. It took approximately 20 seconds for results of hemoglobin concentration to appear on the display. The supervisor had the responsibility to record the readings of both the child and the mother on the questionnaire, a measurement summary form, and a pamphlet with vitamin A, iron, and nutrition information. The latter was left with the mother. The significance of iron deficiency was explained to the mothers, as was the information provided in the pamphlet. In cases of severe anemia, team members instructed mothers to immediately take themselves and/or their children to the nearest health center.

Immediately after taking the drop of blood for the Hemocue, the clinical person made dried blood spots (DBS) to measure vitamin A deficiency in children. Depending on the child's blood flow, as many circles as possible on the fiter paper were filled with one drop of blood each. The cards were then put into a box and left to dry for 12 hours. Once dry, the cards were placed into ziplock bags with a desicant and stored in a freezer at –25 degrees Celcius. In order to validate the DBS, a random sample of 50 capillary blood draws were taken (in most cases from the same fingerprick). After making the DBS, the clinical person let at least four drops of blood flow into a microtube. The microtube was then transported to the clinic in Yapacani where it was immediately put into dry ice. Both DBS cards and microtubes were transported on dry ice back to the United States at the end of the survey. They will be analyzed by Craft Technologies in North Carolina.

Feces samples were taken from a subsample of 120 mothers and their children. The samples were transported back to the lab on ice and analyzed by CEPAC's lab technician. He followed a wet mount protocol, using a saline drop in the left half side of the slide and an iodine drop in the right half of the slide. Using an applicator stick, a small portion of the specimen was then added to each drop. The technician then systematically analyzed the slide under a microscope starting with x10 power, (and using x20 and x30 power, if necessary). Any worm eggs, larvae, protozoan trophozoites, cysts, abnormal white blood cells, or fungus identified were recorded by the technician. One of the CEPAC physicians then made a diagnosis and gave the pharmacy a prescription. The teams then returned back to each house with results, delivering drugs to those mothers and children that needed them. Caretakers were also given a brochure illustrating different kinds of parasites and were shown which type they and their children had.

The survey took five weeks to complete, starting April 3rd and ending May 15th. Obstacles encountered during survey implementation included periodic heavy rainfall that impeded teams' ability to cross rivers- due to flooding- and reach isolated communities. Nevertheless, schedules were changed accordingly to ensure that all communities were reached and that data quality was not compromised. To maintain high data quality, the supervisors read each survey immediately after it was completed. If the supervisor found mistakes, it was his/her responsibility to notify the team and request that they return to the house, if necessary, to correct the mistakes and/or missing

information. Supervisors were also responsible for going through a checklist of essential 'checks and balances' each day before leaving (refer to appendix 9). When taking measurements, at least two team members, if not three, were required to participate in order to avoid measurement and/or data recording errors. Measurements were also recorded on two separate forms in the event that one be damaged or lost. Finally, the Nutrition Survey Director reviewed each questionnaire on a daily basis to monitor team progress, and make certain that supervisors did not overlook any errors. Once the surveys had passed a 'second check,' they were turned over to the data entry person who entered the forms into an EPI Info database.

Results

Statistical Analysis

A variety of univariate and multivariate methods were used to elucidate relationships among variables of interest:

- Frequencies of categorical variables and means and SD of continuous variables
- Chi-squared analysis to look for statistically significant relationships among variables, which could be further explored using more complex analyses
- T-tests, ANOVA (or regression equivalent) or multiple linear regression to look for relationships of continuous outcomes to categorical or continuous variables, respectively
- Multiple linear regression or logistic regression to control for multiple variables when the outcome variable was continuous or categorical, respectively
- Sensitivity and specificity analysis of DBS relative to serum retinol data

Background Information

Six hundred children and their caretakers participated in the survey. Of the 600, 48% were female while 53% were male. Of the caretakers, 96% were the child's mother, 2.7% were the child's grandmother, 0.5% were the child's sibling, and 0.5% were identified in the "other" category (2 adopted mothers, and 1 father). The most frequent age group (24%) encountered was children 12-24 months of age, followed by 24-36 months of age (21%), 36-48 months of age (21%), 48-60 months of age (18%), 6-12 months of age (9%), 1-6 months of age (6%), and less than one month (0.8%).

The majority of children had a health card (65%). Approximately 85% of those with a card had not experienced growth faltering (according to the card), while 13% had experienced growth faltering (note: 2% lacked control of any kind). Most families (57%) had electricity in their homes, as well as a radio (64%) and a television (57%). Of the 251 families (46%) who had a garden, 92% had a fruit garden, 7% a vegetable garden, and 1% both fruit and vegetable. In 506 families (84%), the father supported the family by working an 8-12 hour workday. Half of the families visited owned their own land, and 75% owned their own animals. Of those families that owned animals, 69% reported consuming the products of those animals domestically. The majority of homes (84%) visited had a direct source water in the home, while the rest have less than a kilometer to walk to access water. The majority (77%) had a traditional latrine. In the households surveyed, mothers purchased foodstuffs for the house 68% of the time and prepared it 89% of the time.

In terms of personal caretaker characteristics, 60% (358) were in "open" relationships (that is, living together with their partner but not married), while 30% were married. More than half of the caretakers interviewed had five years or less of formal education. Fifty-nine percent knew how to read, 19% were illiterate, and 22% read only at a very basic level.

Health Knowledge and Care-Seeking Behavior
In terms of child health, 66% of mothers reported that their child was currently well at the time of the survey, 33% reported their child to be sick, and 2% did not know the health of their child. In the two weeks prior to the survey, 61% of children who participated in the survey had had diarrhea, 57% had had some form of a respiratory infection, and 65% had experienced a fever. Approximately 60% of mothers responded that they did not seek help when their child had diarrhea or acute respiratory infections (60% and 63%, respectively). In contrast, 65% of mothers responded seeking help for episodes of fever. Approximately 67% of mothers knew what parasites were and 68% percent claimed that their child had been treated for parasites.

As far as vitamin A and iron knowledge, 81% of mothers reported knowing what iron sulfate tablets were but that they had never taken them. Approximately 80% of mothers recognized vitamin A tablets, but only 41% reported having taken vitamin A before, 57% reported never taking it, and 2% were not sure. With regard to eye problems, the majority of mothers reported not having trouble seeing in the day or at night (84% and 86% respectfully), nor did the majority of children have trouble seeing during the day or night (97% and 99%, respectfully). (This result was somewhat surprising due to the fact that there was anecodotal evidence of nightblindness in the area prior to the survey.) Finally, the majority of mothers (84%) reported not having difficulty with their eyesight in the final trimester of their pregnancy. (We ruled out that the remaining 16% had nightblindness due to the high numbers of women who had eye sight problems in both the day and night.)

Breastfeeding Characteristics
Depending on how the question was worded (question 48 or 49), 96.3% or 88.8% of women reported ever breastfeeding. One hundred seventy eight of the 600 respondents (29.67%) reported currently breastfeeding. Children currently breastfed ranged in age from 0.02-3.32 years of age (1.07 $\pm$ 0.65 years) [or 0.24 – 39.8 months (12.8 $\pm$ 7.8 months)]. Of 36 children currently being exclusively breastfed, the mean age was 0.45 $\pm$ 0.6 years (5.4 $\pm$ 7.2 mo.), with a median of 0.28 years (3.4 mo.).
The majority of women (59%) reported initiating breastfeeding within an hour of birth. Over 50% of women reported exclusively breastfeeding until between 3 and 6 months of age. Specifically, the frequencies associated with the duration of exclusive breastfeeding are as follows: less than one month, 7.3%; 1-2 months, 2.2%; 2-3 months, 5.0%, 3-4 months, 12.3%; 4-5 months, 18.5%; 5-6 months, 24.0%; over 6 months, 12.8%. (Six percent reported currently <u>exclusively</u> breastfeeding, as detailed above.)
When asked when other liquids were added to the child's diet (question 53), 4% of respondents reported not having added other liquids yet. Twenty-eight percent reported adding other liquids prior to 4 months of age; 35% reported adding liquids at 4-6 months; and 30% reported adding liquids from 6-12 months. Fewer than 3% of respondents reported adding liquids after one year, or did not know when liquids were added. Of 877 reports of liquids added to the diets of breastfeeding babies (question 54), soups were most commonly added (299 responses), followed by tea (146 responses), water (131 responses), formula (122 responses), and juice (106 responses). When asked if formula was given (question 55), 57% of all respondents reported ever giving formula. This shows that while the majority of women reported giving formula, it was not the most common liquid offered to children. Of 385 responses as to why formula was given (question 56), the most common response was that the child was not satisfied with breastmilk (114 responses), or that the mother lacked sufficient breastmilk (92 responses).

Among women whose children were eating solid foods (question 39), 50.1% (283/556) reported adding solids to the diet between 6-12 mo; 32.3% (180/556) reported adding solids to the diet between 5-6 months; 16% (89/556) began adding solids prior to 5 months of age.

The average age of weaning reported (question 51) was 14.6 $\pm$ 6.9 months, ranging from 0.2 to 51 months. A variety of responses were offered as to why breastfeeding was stopped (question 52). Of 454 responses, the most common (157/454, 35%) was that the child was getting big. Sixty-four of 454 (14%) women reported a subsequent pregnancy. The child rejecting the breast (11%), mother's work (9%), insufficient milk (6%), illness of the child (6%), or illness of the mother (6%) were also cited.

Anthropometric Assessment of Children

Table 1 shows summary data from 596 children. Children with height-for-age or weight-for-height Z-scores beyond 5 standard deviations from the mean were removed from the analyses due to the probability that their measures were done or reported incorrectly. Weight-for-age is the least specific measure of undernutrition, as it does not distinguish the contributions of stunting (height-for-age < -2 Z-scores) or wasting (weight-for-height < -2 Z-scores) to underweight. An examination of the distributions of the anthropometric measures shows that the majority of children had appropriate weight for age ($\geq$ -1 Z-score), although over 30% were underweight for their age (< -1 Z-score). The majority of children were short for their age but had appropriate weight given their height. As expected, wasting in the population was rare, but stunting was common. Analyses from this point on examine predictors of stunting in this population.

Table 1. Anthropometric Indices of Children in Ichilo Province, Bolivia

	Weight for Age	Height for Age	Weight for Height
Mean Z-score (SD)	-0.48 $\pm$ 1.14	-1.12 $\pm$ 1.27	0.26 $\pm$ 0.98
$p \geq 1$ Z (%)	10.1	5.37	21.3
$-1 \leq p < 1$ Z	56.9	38.8	69.8
$-2 \leq p < -1$ Z	26.5	33.4	7.7
< -2 Z	6.5	22.5	1.17

Age was a dramatic contributor to rates of stunting. Table 2 shows rates of stunting associated with 6-month age intervals. Rates of stunting increased from 12-18 months, peaked at 18-24 months, and plateaued beyond 24 months. Odds of being stunted were nearly 13 times greater for children in the second year compared to the first, and 10 times greater for children beyond the second year compared to the first year of life.

Table 2. Relationship of age to stunting in children 0-60 months of age

	Age in Months									
	0-6	6-12	12-18	18-24	24-30	30-36	36-42	42-48	48-54	54-60
n	42	53	61	86	70	54	70	53	52	55
stunted (%)	0	5.7	21.3	34.9	18.6	29.6	18.6	26.4	30.8	29.1

In unadjusted analyses, other variables that predicted stunting included some related to socioeconomic status, such as lack of electricity (p < 0.023), lack of a radio (p < 0.026), and lack of a television (p < 0.007). Stunting is classically related to poverty, so these variables may imply that these families were relatively more impoverished. Maternal characteristics also predicted stunting in unadjusted analyses: children of widowed or single mothers were more likely to be stunted than

children with a mother and father (30% versus 21%, p < 0.051). Mothers of stunted children were older (31.6 ± 9.9 versus 27.9 ± 8.0 years, p < 0.001), and had fewer years of education (4.0 ± 3.3 versus 5.4 ± 3.5 years). Stunting was also related to the mother's ability to read. Literate mothers had less than a 50% chance of having a stunted child (57 of 350 children stunted). Illiterate mothers, on the other hand, had a higher risk of stunting (40/115 stunted), while those with some reading ability had an intermediary risk of stunting (37/131 stunted). There was also some suggestion that the time at which solid foods was introduced may have impacted risk of stunting, with 34% of children who were given foods prior to 6 months stunted versus 26% in children given solid foods later (p < 0.011). This finding does not make intuitive sense, but may suggest that starting solid foods too late may put children at risk of undernutrition as breastmilk becomes insufficient to meet nutritional needs. Regardless, this finding was not important in the adjusted analyses.

In adjusted analyses, the age of the infant was the strongest predictor of stunting. The odds of being stunted were more than 11 times greater in the second than the first year of life (p < .001), and more than 8 times greater in the third than first year of life (p = 0.001). Single mothers were more than 2.5 times likely to have a stunted child (p = 0.02), as were older mothers, with a 3% increase in the odds of stunting for each additional year of maternal age (p = 0.02). Among these respondents, younger women were more likely to be able to read (p < 0.001) and were more educated than older women (p < 0.001), but these variables themselves were not significant in the adjusted analyses. Younger maternal age may also be a proxy for reduced parity, in other words older mothers have more children, increasing the risk of stunting among siblings.

Iron Status of Children

Anemia was defined as hemoglobin concentrations under 10.5 g/dL in children up to 1 year of age and under 11.0 g/dL in children 1-5 years of age. It should be remembered that early infancy is a time of dramatic change in hemopoietic indicators, so that hemoglobin concentrations are difficult to interpret in children under 6 months of age. Also, children under 6 months of age are not generally considered to be at risk of anemia, as they typically have sufficient iron stores from the third trimester of gestation.

Overall, 41.7% of children were anemic (95% CI 37.7 - 45.6%). Table 3 shows the proportion of children considered anemic by age, as well as the odds of being anemic compared to the 0-6 month old reference group. Clearly, this problem was most severe in late infancy and persisted into the preschool years.

Table 3. Proportion of anemic children and odds of being anemic by 6-month age intervals

	Age in Months									
	0-6	6-12	12-18	18-24	24-30	30-36	36-42	42-48	48-54	54-60
n	42	54	62	86	71	54	71	53	52	55
anemic (%)	11.9	63.0	72.5	61.6	43.7	40.7	35.2	24.5	21.2	22.0
OR		12.6	19.6	11.9	5.7	5.1	4.0	2.4	2.0	1.8
p-value		<.01	<.01	<.01	<.01	<.01	.01	.13	.24	.29

In unadjusted analyses, anemia in children seemed less likely to occur among mothers who worked less than 8 hours per day compared to those who worked 8-12 hours (p = 0.04). Anemia was also less likely among those who did not defecate in a field (p = 0.009), and among those who

reported using animal products for both sale and eating (p = 0.049). Contrary to the findings in stunting, mothers of anemic children were younger than those of children who did not have anemia (27.0 $\pm$ 7.2 versus 29.9 $\pm$ 9.8 years, p < 0.001). However, as in the case of mothers of stunted children, mothers of anemic children were not as well educated (4.7 $\pm$ 3.2 versus 5.4 $\pm$ 3.7 years of schooling, p < 0.02). Also unlike the case of stunting, a higher risk of anemia was found among children who were introduced to solid foods later, with significantly greater odds of stunting in children introduced to solid foods at any time beyond 3 months (p < 0.001). Anemia was also more common in children who reportedly had diarrhea within the last 2 weeks (49.6% anemic with diarrhea versus 36.5% anemic without, p = 0.002), and was more common among those children in whom fever was reported (49.1% anemic of those with fever versus 37.6% without, p = 0.007). Finally, stunting was also significantly related to the presence of anemia in children (p = 0.007).

In adjusted analyses, the odds of being anemic were approximately 1.5 times greater among boys compared to girls (p < 0.05), and anemia was a particular problem between 6 months and 3 and-a-half years of age. Using a field to defecate was highly predictive of anemia, with the odds of being anemic nearly 7 times greater among children who defecated outdoors compared to those who used a latrine (p < 0.001). Children whose families had animals available for both consumption and sale were half as likely to be anemic (p = 0.005). Increasing maternal age and education also made anemia in children approximately 10% less likely (p < 0.001 for both variables). Finally, the presence of fever made anemia approximately 1.6 times more likely (p = 0.05).

Despite the fact that anemia was associated with the use of a field for defecation, no association existed between the presence or degree of any of the measured parasitic infections and anemia. A relatively small sample size in the substudy, with over 20% of the group at low risk for any parasitic infection due to their age, may have precluded us from finding any such association.

Maternal Iron Status

A cut-off of 12 g/dL was used to describe anemia among women in the population. Hemoglobin concentrations averaged 12.2 $\pm$ 1.7 g/dL, and 40.0% of women were considered anemic (95% CI 36.1 - 44.0%).

In univariate analyses, education and the ability to read had a significant impact on anemia. Women who were anemic had fewer years of education than those who were not anemic (4.64 $\pm$ 3.6 vs 5.4 $\pm$ 3.5 years, p = < 0.001). The ability to read also decreased the likelihood of anemia (p = 0.038). However, in adjusted analyses, only the location of the bathroom had a nearly significant impact on maternal iron status, with women who used a field being twice as likely to have anemia (p = 0.066).

This surprising finding suggests that helminth burden may contribute substantially to anemia among women. However, among women in whom helminths were assessed, only trichuris (pinworm) and the degree of uncinarias (hookworm) burden were related to iron status. Pinworm prevalence was relatively rare, found in 6% of children and 7% of mothers. Hookworm, however, was found in 16% of children and 26.8% of mothers. These parasites may be the most likely parasites to adversely affect iron status in both mothers and children.

Vitamin A Status of Children
  a. Validation of DBS retinol
Six hundred dried blood spot (DBS) samples were collected in the survey. A subsample of 44 children was randomly choosen to provide a capillary serum sample (i.e. several drops of blood in a microtube) along with the DBS, in order to establish a validation group for the DBS samples. Dr. Neal Craft prepared a report examining the relationship between the retinol assessed in the 600 DBS and the capillary serum samples. (Refer to Appendix 9 for the report.) Among the 44 children who provided capillary serum samples, mean retinol values were 19.77 $\pm$ 5.9 mcg/dL, ranging from 8 -

33.9 mcg/dL. Mean retinol values in DBS samples from these children were 22.6 $\pm$ 7.4 mcg/dL, ranging from 7.6 - 40.2 mcg/dL. Although these values seemed quite comparable, they were in fact statistically significantly different (p = 0.05). Although mean retinol was higher in the DBS samples, fewer individuals were identified as vitamin A deficient (VAD) using a cutoff of 20 mcg/dL, suggesting the misclassification of individuals in the DBS relative to the serum analyses. (Comparing the DBS to serum samples should have provided equivalent information.) Among the validation group, the sensitivity for identifying VAD by DBS was 66.7%, and the specificity was 75%. Approximately 70.5% of DBS cards were correctly classified, using serum as the gold standard, while 25% had defects of some sort. Of the remaining 556 population DBS cards, 41.5% were identified as defective in some way (p = 0.03).

To determine whether the DBS serum values obtained were likely to be substantially different in the entire population versus the subsample (i.e. the validation group), comparisons were made on a variety of attributes between the subsample and the rest of the population. Differences were minor and may have been spurious. The presence of electricity and radios were more common in homes of children in the subsample (p = 0.06 for both variables), but there was no difference in the presence of televisions. A higher proportion of individuals in the validation group obtained water in their home (p = 0.04). However, the validation group was less likely to own their own land (p = 0.001). Finally, children in the validation group had somewhat greater weight-for-height Z-scores (0.57 $\pm$ 1.05 versus 0.26 $\pm$ 1.06, p = 0.06). Overall, these analyses suggest that children in the validation subsample may have been somewhat better off than the average child in the population. A slight difference between the two groups, however, would not suggest that serum retinol status would be substantially better or worse between the two groups. Therefore, we would expect serum retinol concentrations in the entire population to fall close to 22 mcg/dL. This is very close to the cutoff for vitamin A deficiency of 20 mcg/dL. If more than 40% of a population is classified below 20 mcg/dL, the locale is considered to have a significant VAD public health problem.

b. Impact of Defective DBS cards

Mean retinol was 21.3 $\pm$ 0.08 mcg/dL, but it was significantly lower among children with defective DBS compared to those whose DBS were of adequate quality (19.0 $\pm$ 8.0 versus 22.9 $\pm$ 8.2 mcg/dL, p < 0.001). Without considering DBS quality, 51.7% (95% CI 47.6 - 55.7%) of individuals had retinol concentrations below 20 mcg/dL (VAD); however subjects were more likely to be classified as VAD if their DBS was defective than of adequate quality (63% versus 44%, p < 0.001). Ninety-five percent confidence intervals for these estimates are 56.4 - 68.9% and 38.9 - 49.4%, respectively. An alternative definition of VAD as a public health problem is when more than 5% of individuals have retinol concentrations below 10 mcg/dL. Our sample was not large enough to be able to use this criteria with sufficient precision. However, in total in this population 4.5% of children (95% CI 3-6.5%) had retinol below 10 mcg/dL; of these 74% (20/27) of DBS samples were defective. Thus, it appears that if the defective DBS cards are eliminated from the analyses, VAD as a public health problem based on current criteria cannot with certainty be identified in this population. The mean retinol concentration and the proportion of vitamin A deficient individuals with adequate DBS cards suggests the population is borderline and at risk of VAD.

Because DBS cards were more likely to be defective in the entire study group than among the validation subsample, we sought to determine whether there were any characteristics of the population that predisposed to defective DBS cards. Children with defective DBS cards were:

- younger (2.25 $\pm$ 1.26 versus 2.67 $\pm$ 1.38 years old, p = 0.0002);
- less likely to have electricity (p < 0.001) and television (p = 0.012);

- more likely to defecate outdoors (p < 0.001);
- more likely to have to leave the home to obtain water (p = 0.01);
- more likely to rent land (p = 0.01);
- less likely to have mothers who could read (p = 0.05);
- less likely to have mothers that did the shopping (p = 0.07);
- less likely to be served first at the table (p = 0.018);
- more likely to be anemic (p < 0.001);
- and had somewhat lower weight-for-age Z-scores (-0.58 $\pm$ 1.11 versus -0.39 $\pm$ 1.29, p = 0.07).

Factors such as lower age, poorer hygienic conditions, and the presence of anemia suggest that DBS may have been more difficult to obtain in the group with defective DBS. However, all of these factors may also be predictive of a greater probability of *true VAD*. All analyses designed to determine predictors of VAD controlled for DBS quality. This was done in an attempt to distinguish whether defective DBS samples resulted from conditions that caused VAD deficiency, or whether the samples were more likely to classify individuals as VA deficient. Because of the difficulty in distinguishing between factors that hampered adequate DBS collection, true VAD, as well as the degree of misclassification of VAD in the validation substudy, it can be concluded that the DBS methodology did not perform reliably in this setting. This is true despite vigorous efforts of quality control and appropriate sample collection.

c. Factors Related to VAD

In keeping with the previous analyses, Table 4 shows the proportion of children considered VAD by age, as well as the odds of being VAD after controlling for the quality of the DBS samples. Low retinol was most likely to be seen in the youngest age group. The odds of being VAD decreased by more than half for children 30-36 months. In other words, retinol levels did not significantly improve until children were between 30-36 months of age.

Table 4. Proportion of VAD deficient children and odds of being VAD by 6 month age intervals After Adjusting for Presence of DBS Defects.

	Age in Months									
	0-6	6-12	12-18	18-24	24-30	30-36	36-42	42-48	48-54	54-60
n	42	54	62	86	71	54	71	53	52	55
VAD (%)	64.3	61.1	53.2	54.7	62.0	44.4	43.7	37.7	44.2	50.9
OR*		.73	.57	.60	.85	.44	.40	.34	.47	.59
p-value		0.5	0.2	0.2	0.7	.05	.03	.012	.08	.22

Because of the overwhelming impact of DBS defects, which doubled the odds of being considered VAD (p < 0.001), few other variables emerged as important predictors of VAD. (This lack of association may also be compounded by potential misclassification of true VA deficient individuals.) In adjusted analyses, age of the child became unimportant. Additionally, the odds of becoming VAD reduced when animals were used for food and/or sale (p = 0.02), and when the child ate dinner with both parents (p = 0.004) or a caretaker (p = 0.027) versus eating with his/her mother.

d. VAD: Summary and Interpretation

The DBS methodology used in this study made it difficult to precisely determine the degree and potential causes of VAD in this population. Nonetheless, mean serum retinol concentrations are likely to fall between 19 and 22 mcg/dL, suggesting that regardless of DBS quality, nearly half

the population is likely to fall close to or below the currently accepted cutoff for vitamin A sufficiency of 20 mcg/dL. Populations with less severe vitamin A deficiency in Guatemalaand the Philippines (2) have shown dramatic improvements in serum retinol concentrations as a consequence of sugar and margarine vitamin A fortification programs. [15,16] Therefore, this population of children is likely to benefit from an intervention that includes enhancing vitamin A intake. Possible food-based interventions palatable in this population will require further analysis of the food frequency data.

Parasitic Infections

Parasites were very common among women and children, as summarized in Table 5. Among children, parasitic infection became more common with increasing age ($p < 0.001$; Table 6). Children were more likely to have parasites if their mother did ($p = 0.03$). Among 88 women with helminth infections, 64 of their children also had parasites, while 24 did not. Among 31 women without parasites, 16 of their children had parasites, while 15 did not.

Table 5. Prevalence of Parasitic Infections Among Children and their Mothers.

	Children	Mothers
Any Parasitic Infection	62.1%	74.8%
Specific Parasites		
Ascaris lumbricodes	29.8%	30.1
Amoeba histolitica	6.9%	24.4%
Giardia lamblia	34.4%	18.7%
Trichuris trichura[17]	6.1%	7.3%
Uncinarias[18]	16.0%	26.8%
Himinolepsis Nana	2.3%	0.8%

Table 6. Association of Having any Parasitic Infection with Age Among Children

	0-6 mo	6-12 mo	12-18 mo	18-24 mo	> 24 mo
No worms	5	8	7	8	22
Worms	0	2	7	13	60
Total N	5	10	14	21	82

Discussion

Patterns of undernutrition related to age are "typical" for the region and correspond to the time of weaning. Kids in late infancy through the toddler years are at highest risk for developing stunting and iron deficiency. Both of these conditions tend to be less severe as children reach the preschool years. Vitamin A deficiency does not appear to be as predictably related to age, but children in this population appear to be at risk of VAD

---

[15] Pineda, O. Fortification of sugar with vitamin A. Nutriview 1993; 2:6-7.

[16] 2. Solon FS, Solon MS, Mehansho H, West KP Jr, Sarol J, Perfecto C, Nano T, Gabilla A, Sanchez L, Isleta M, Sommer

A. "Effect of vitamin A fortified margarine in rural preschool children in the Philippines." Report of the XVI IVACG

Meeting, Chiang Rai, Thailand. Washington DC: The Nutrition Foundation Inc, 1994.

[17] Pinworm

[18] Hookworm

Educating mothers about weaning foods that are rich in calories, vitamins, and minerals would be an important intervention to pursue. Because soups seem to be frequently given in infancy, exploring the possibility of altering recipes or enhancing the nutritional quality of soups may be warranted. It is important to realize, however, that a food-based intervention will not be sufficient to prevent micronutrient deficiencies and that supplements must also be included in any nutrition intervention. Further analysis of food frequency data will be crucial for making recommendations as to what dietary habits might be changed.

BIBLIOGRAPHY

Academy for Educational Development. 2000. <u>Maternal Nutrition: Issues and Interventions</u>. The Linkages Project, Washington, DC.

Child Survival Technical Support Project (CSTS). 2000. <u>Knowledge, Practices and Coverage Survey</u>. CSTS, Calverton, MD.

Food and Agriculture Organization of the United Nations. 1997. <u>Human Nutrition in the Developing World</u>. FAO, Rome.

Food and Agriculture Organization of the United Nations. 1997. <u>Preventing Micronutrient Malnutrition: A Guide to Food-Based Approaches</u>. International Life Sciences Institute, Washington, DC.

International Eye Foundation. 2000. <u>Capacity Building for Quality Child Survival Interventions: the CEPAC/IEF Proposal</u>. IEF, Bethesda, MD.

Montague, J. 1973. "Protein Deficiency in Early Life," <u>JAMA</u>. Vol. 3(14); Pgs. 1318-1325.

Opportunities for Micronutrient Interventions (OMNI). 1997. <u>Micronutrient Malnutrition Facts: Technical Series</u>. USAID/JSI (John Snow, Inc.), Washington DC.

UNICEF. 1998. <u>Food Fortification in Brazil: Investing in Health and Nutrition</u>. A Discussion Paper. UNICEF, Brasilia, Brazil.

Appendix 1: PEOPLE INVOLVED IN THE SURVEY

Dr. Mabel Morales, Co-Director of Health, CEPAC

Dr. Oswaldo Chavez, Co-Director of Health, CEPAC

Ms. Miriam Mullini, CEPAC Nutrition Coordinator

Ms. Femida Gutierrez, Buena Vista Area Supervisor, CEPAC

Ms. Rosemary Samacuri, Yapacani Area Supervisor, CEPAC

Ms. Delia Llanos, San Carlos Area Supervisor, CEPAC

Kirk Leach, CS Project Director, IEF Bolivia

Alejandra Urioste, CS Project Support Staff, IEF Bolivia

Gwen O'Donnell, Nutrition Survey Director (and Child Survival/Vitamin A Coordinator), IEF USA

Lily Riva Clement, External Consultant

Dr. Kerry Schulze, External Consultant, Dept. of Human Nutrition, Bloomberg School of Public Health

Survey Team Members: German Zellada, Ambrocio Vallejos, Abraham Soliz, Claudia Ortiz, Irene Ticona, Justina Condori, Ramiro Ancase, Mery Elena Melean, and Luiz Rocha for excellent work.

Appendix 2- POPULATION DATA

*Dried

Blood Spot

Localidad	Pop. 1992	Pop. Estim. 2001	Acum Pop.	Cluster No.	No. of Survs.	No. of Feces Smpls	No. of DBS*
Buena Vista	2873	2933	2933	1, 2	40	8	40
Caranda	568	580	3513				
San Miguelito	204	208	3721				
Arboleda Centro Carretera	670	684	4405	3	20	4	20
Delicias	197	201	4606				
Potrerito-Cairito-Carmen	273	279	4885				
El Cairo	267	273	5157				
Potrero Marcelo	177	181	5338				
Santa Barbara	221	226	5564	4	20	4	20
Agua Caliente	185	189	5753				
Sindicato Colorado	202	206	5959				
Sindicato Monterrico	135	138	6097				
Sindicato Salitral	105	107	6204				
Villa Diego	355	362	6566				
Zona dispersa Espejitos	261	266	6833	5	20	4	20
Santa Rosa	209	213	7046				
Comunidad Espejitos	155	158	7204				
Villa Amboro	172	176	7380				
Sindicato El Triunfo	114	116	7496				
Sindicato El Carmen	577	589	8085				
Cooperativa El Cheyo	213	217	8303				
Recompensa I	419	428	8730				
Camino Huaytu	905	924	9654	6	20	4	20
San Isidro	512	523	10177				
Comunidad San Isidro	194	198	10375	7	20	4	20
Camino San Isidro - Caranda	318	325	10700				
San Javier	325	332	11031				
Palacios	51	52	11084				
San Javier	274	280	11363				
San Miguel	490	500	11863				
San Miguel Rincon	243	248	12112				
San Miguel Afuera	247	252	12364				
San Carlos	3223	3290	15654	8, 9	40	8	40
Santa Fe de Yapacani	4029	4113	19767	10,11,12	60	12	60
Buen Retiro	1544	1576	21343	13	20	4	20
Colonia Villa Antofagasta	605	618	21961				
San Juan de Yapacani	2344	2393	24354	14	20	4	20
Estancia Raul Menacho	305	311	24665	15	20	4	20
San Pedro de Yapacani	202	206	24871				

Maria Auxiliadora	137	140	25011				
Esatancia Hugo Molina	112	114	25125				
Sindicato 6 de Agosto-Chapaco	111	113	25239				
Ayacucho - El Carmen	177	181	25419				
Sindicato Guadalquivir	232	237	25656				
Sindicato los Andes-Sta. Fe 2 de Agosto	225	230	25886				
Enconada	395	403	26289	16	20	4	20
Sindicato Bolivar, Villa Montes	133	136	26425				
Villa Cotoca	177	181	26606				
Faja Litoral-Sind. Mejillones	256	261	26867				
Faja Calama	134	137	27004				
Ayacucho - El Carmen	165	168	27172				
San Luis, Abaroa y 2 de Agosto	260	265	27438				
Estacion Buen Retiro	202	206	27644				
Sindicato Aguas Balancas	174	178	27822				
Camino Antofagasta Buen Retiro	86	88	27909				
Sindicato Piquiri	147	150	28059	17	20	4	20
San Lorenzo	341	348	28408				
San Carlos La Lidia	182	186	28593				
Camino San Lorenzo	181	185	28778				
San Carlos, Buena Vista, Sta Fe	482	492	29270				
Surutu- Atacagua	114	116	29387				
Los Mojos	84	86	29472				
Aguas Bonitas	161	164	29637				
Oriente Chichas	16	16	29653				
Mataracu y Sin. 2 de Agosto	90	92	29745	18	20	4	20
25 de Septiembre	281	287	30032				
Colonia San Juan	1040	1062	31093				
Yapacani **Villa German Bush**	8585	8764	39858	19,20,21 22, 23	100	20	100
San German de Yapacani	824	841	40699	24	20	4	20
Sindicato 16 de Julio	154	157	40856				
Sindicatos Arboleda-La Ele	252	257	41113				
Sindicato 24,22,8 de Sept.	378	386	41499				
Illimani Norte Sur	151	154	41653				
Puerto Grether-Coop. Santa Fe	286	292	41945	25	20	4	20
El Palmar	83	85	42030				
Sindicato Naranjal	337	344	42374				
San Jose Alto	369	377	42751				
Sindicato San Jose Bajo	108	110	42861				
Sindicato Las Petas	96	98	42959				
San Salvador-San Antonio	261	266	43225				
Valle Hermoso	146	149	43374				
Abanico 1	242	247	43621	26	20	4	20
Area Dispersa Hsta. Entrada	158	161	43783				

Abanico- Coumidad Chore							
Area Dispersa Hasta Rio Chore	248	253	44036				
Sindicato Luna Nueva	266	272	44307				
Villa Chore-El Palmar	444	453	44761	27	20	4	20
Barrientos	273	279	45039				
Villa Chore	425	434	45473				
Sindicato Moiller 27	228	233	45706				
Zona El Palmar San Germam	299	305	46011				
Sindicato Litoral	212	216	46228				
El Palmar UV-1, UV-2	552	564	46791				
Sindicato Ichilo	202	206	46997	28	20	4	20
Tercera Transversal, Villa Union	107	109	47107				
6 de Agosto San Isidro	220	225	47331				
Sindicato Condor	374	382	47713				
Sindicato Abaroa	374	382	48095				
Central Km 50-45	164	167	48262				
Viña del Mar	90	92	48354				
Puerto Abaroa	386	394	48748	29	20	4	20
Chorolque Km35 Km38	242	247	48995				
Cooperativa 1º de Mayo	240	245	49240				
Agrario Nuevo Horizonte	219	224	49464				
Cooperativa 2 de Abril	181	185	49649				
Villa Nuevo Horizonte	264	270	49918				
Sindicato Challavito	89	91	50009				
Cooperativa 15 de Agosto	173	177	50186				
Los Pozos	263	268	50454	30	20	4	20
Puerto de Palo	106	108	50562				
Comandito-Abanico 34	127	130	50692				
Cooperativa 27 de Mayo	256	261	50953				
Cooperativa Linares-San Miguel Troncal	111	113	51067				
Villa Esperanza	98	100	51167				
Abanico 21-Villa Imperial	199	203	51370				
Comunidad Simon Bolivar-Sindicato Abanico 18	162	165	51535				
Abanico Km. 15	180	184	51719				
Abanico 2-3 Arroyo Agua Dulce	149	152	51871				
KM 10							
Total	50811	51871					

CUESTIONARIO DE NUTRICIÓN A LOS ENCARGADOS DE NIÑOS MENORES DE CINCO AÑOS LA PROVINCIA DE ICHILO, SANTA CRUZ, BOLIVIA 2001

Nombre de entrevistador(a): _____

Fecha de entrevista: (día/mes/año) _____

Nombre de la comunidad: _____

Número de conglomerado: _____

Número de la casa de identificación: _____

A. CONSENTIMIENTO INFORMADO

Buenos días/tardes:

El motivo de nuestra visita es para averiguar sobre la salud de usted y de sus niños. Por esto estamos recogiendo información de 600 casas en la Provincia de Ichilo. Con esta información haremos un programa para mejorar el nivel de salud de sus niños. Entonces, necesitamos saber como se están alimentados, si tienen anemia o no (anemia es la falta de sangre), y si tienen bichos/gusanos en la barriga. Además necesitamos saber si a su niño le falta vitamina A. (La falta de vitamina A hace que el niño se enferme más y puede tener problemas con la vista.) Así quisiéramos hacerle algunas preguntas y después sacar una gotita de sangre de Ud. y de su niño. Los resultados de análisis de anemia les entregaremos en este momento.

Para averiguar si tienen bichos/gusanos, necesitamos un poco de ¨caca¨/ caquita. Los resultados y tratamiento gratuito serán entregados por los equipos móviles, puestos de salud, o centros médicos (dependiendo de lugar).

Si Ud. dispone del tiempo y está dispuesto a participar, favor decirnos que está de acuerdo y responda a las preguntas. Muchas gracias.

La persona encargada de cuidar al niño menor de cinco años está de acuerdo de participar: SI = 1   NO = 2   ☐

B. NIÑO MENOR DE CINCO AÑOS

1. ¿Hay niños menores de cinco años en esta casa?   SI = 1   NO = 2   ☐

2. ¿Está disponible la mamá o la persona encargada de estos niños? (Quisiéramos hablar con la persona que cuida a los niños.)   SI = 1   NO = 2   ☐

3. ¿Cuánto tiempo vive aquí?   ☐
   1. Menos que un año   3. Más que 5 años
   2. Menos que 5 años   4. Más que 15 años   5. Otro: _____

4. [*Si ha vivido aquí menos de un año*]: ¿Vivía en la Provincia Ichilo antes de venir aquí?
                                                                        SI = 1   NO = 2   ☐

5. ¿Le gustaría hablar en castellano o quechua?   ☐
   1. Castellano   2. Quechua

6. ¿Cuál es su nombre? _____

7. ¿Qué relación tiene con el niño(-a)? ☐
   1. La mamá   4. Un niñera
   2. Una hermana (o)   5. Una tía
   3. La abuela   6. Otro: _____

8. ¿De cuántos niños menores de 5 años de edad que viven en esta casa está encargada?
   _____ ☐

9. ¿Cuales son los nombres y edades de ellos?

NOMBRE:	SEXO:	EDAD: (Años y meses)
a.		☐.☐ ☐
b.		☐.☐ ☐
c.		☐.☐ ☐
d.		☐.☐ ☐
e.		☐.☐ ☐

[Escoja a un niño al azar, y si está, anote su nombre (*Si **no está**, escoja otro niño al azar)*:
_____]

10. (Sexo del niño)   MUJER = **1**   HOMBRE = **2** ☐

11. ¿Tiene un carnet de salud infantil para (nombre)?
    SI = **1**   NO = **2**   [Si es NO, vaya a #13] ☐

12. [Verificar en el carnet de salud si el niño ha experimentado una falta de crecimiento en los últimos seis meses.]
    SI FALTA DE CRECIMIENTO = **1**   NO FALTA DE CRECIMIENTO = **2** ☐

13. ¿En qué día/mes/año nació *(nombre del niño)*? _____ ☐☐ / ☐☐ / ☐☐

14. [*Verificar la edad del niño en años y meses*]
    Edad del niño: [Años y meses]   ☐. Años   ☐☐ meses

C. DATOS GENERALES
15. ¿Hay electricidad en la casa?   SI = 1   NO = 2 ☐

16. ¿Hay un radio en la casa?   SI = 1   NO = 2 ☐
17. ¿Hay una televisión en la casa?   SI = 1   NO = 2 ☐

18. ¿Tiene un huerto?   SI = 1   NO = 2; [Si es NO, vaya a #20) ☐

19. ¿Qué tipo de huerto es? ☐

1. De verduras	3. Ambos	
2. De frutas	4. Otro: _____	

20. ¿Quien mantiene la familia? ☐
    1.   Madre   4. Otros miembros de la familia
    2.   Padre   5. Abuelo (a)
    3.   Tío (a)   6. Otro: _____

21. El/La que mantiene la familia, ¿cuantas horas trabaja por día? ☐
    1. Menos de 4 horas   3. De 8 a 12 horas
    2. De 4 a 8 horas   4. Otro: _____

22. ¿De donde recogen su agua? ☐
    1. El grifo domiciliario   5. Noria o pozo con balde
    2. Un bomba rosario   6. Vertiente
    3. El río   7. Otro: _____
    4. Pileta pública

23. ¿Qué distancia tiene que ir para recoger su agua? ☐
    1.   En la casa   4. 5-10 Km
    2.   Menos que un Km.   5. 10 - 10+ Km
    3.   2-5 Km.   6. Otro: _____

24. ¿Donde van al baño? ☐
    1. Una taza higiénica con arrastre de agua (Indoro)
    2. Letrina tradicional o pozo común
    3. Letrina mejorada o seca
    4. Campo abierto
    5. Otro: _____

25. ¿La familia tiene terreno propio para cultivar o alquilar a otras personas?
                                    SI = 1   NO = 2; [Si es SI, vaya a #27) ☐

26. ¿La familia tiene terreno alquilado para cultivar?   SI = 1   NO = 2 ☐

27. ¿Poseen animales?   SI = 1   NO = 2; [Si es NO, vaya a #30] ☐

28. ¿Qué tipo de animales tienen?   ☐ ☐ ☐
    1. Gallinas   3. Patos   5. Cordero   7. Cabra
    2. Vacas   4. Cerdo   6. Conejo   8. Otro: _____

29. ¿Su familia comen los productos/(la carne) de los animales o los venden? ☐
    1. Consumo domestico   3. Ambos
    2. Vendidos   4. Otro: _____

D. DATOS DE LA PERSONA ENCARGADA DEL NIÑO

30. Estado Civil: □
    1. Unión libre   3. Divorciada   5. Viuda
    2. Casada   4. Soltera

31. ¿Cuántos años cumplidos tiene? □ □

32. ¿Cuántos años asistió a la escuela? □ □

33. ¿Sabe leer?   SI = 1   NO = 2   POCO = 3;   [*Verificarlo*] □

34. ¿Trabaja fuera de la casa?   SI = 1   NO = 2; [Si es NO, vaya a #37] □

35. ¿Cuál es su trabajo fuera de la casa? □
    1. Vendedora   4. Comerciante
    2. Profesora   5. Trabajador del chaco
    3. Sector salud   6. Otro: _____

36. ¿Cuantas horas por día trabaja fuera de la casa? □ □

E. PRACTICAS SOBRE ALIMENTACIÓN INFANTIL *"Ahora quisiera hacerle algunas preguntas sobre la práctica de alimentación en su casa."*

37. ¿Quién compra los alimentos y los lleva a la casa? □
    1. La mamá   3. Un hermano(a)   5. Tía
    2. El padre   4. Abuela   6. La madre y el padre   7. Otro: _____

38. ¿Quien prepara la comida en su casa?
    1. La mamá   3. La abuela □
    2. Un hermano(a)   4. Varias personas por turno   5. Otro: _____

39. ¿A qué edad le empezó a dar comida seca?   [Si es #7, vaya a 40] □
    1. 2 meses   4. 5 meses   7. Ninguno (sigue lactando solamente)
    2. 3 meses   5. 6 meses   8. Otro: _____
    3. 4 meses   6. 6 meses- 1 año

40. En total, ¿cuantas veces por día come su hijo normalmente? □
    1. Uno   3. Tres   5. Cinco
    2. Dos   4. Cuatro   6. Otro: _____

41. ¿Qué es lo que comió más *(nombre del niño)* durante la semana pasada para el desayuno?
    [Marque una o más opciones.] □ □ □
    1. Sopita   7. Arroz   13. Café   19. Maíz en mote
    2. Pan   8. Queso   14. Locro   20. Chicha de maíz
    3. Huevo   9. Fruta   15. Fideo   21. Avena

4. Carne	10. Leche materna	16. Yuca	22. Té
5. Pollo	11. Leche de vaca	17. Ensalada	23. Verduras
6. Carne/Monte	12. Leche de tarro	18. Papa	24. Cocoa 25. Otro:___

42. ¿Qué es lo que comió más *(nombre del niño)* durante la semana pasada para el almuerzo?
[Marque una o más opciones.] ☐ ☐ ☐

1. Sopita	7. Arroz	13. Café	19. Maíz en mote
2. Pan	8. Queso	14. Locro	20. Chicha de maíz
3. Huevo	9. Fruta	15. Fideo	21. Avena
4. Carne	10. Leche materna	16. Yuca	22. Té
5. Pollo	11. Leche de vaca	17. Ensalada	23. Verduras
6. Carne/Monte	12. Leche de tarro	18. Papa	24. Cocoa 25. Otro:___

43. ¿Qué es lo que comió más *(nombre del niño)* durante la semana pasada para la cena?
[Marque una o más opciones.] ☐ ☐ ☐

1. Sopita	7. Arroz	13. Café	19. Maíz en mote
2. Pan	8. Queso	14. Locro	20. Chicha de maíz
3. Huevo	9. Fruta	15. Fideo	21. Avena
4. Carne	10. Leche materna	16. Yuca	22. Té
5. Pollo	11. Leche de vaca	17. Ensalada	23. Verduras
6. Carne/Monte	12. Leche de tarro	18. Papa	24. Cocoa 25. Otro: ____

44. ¿Qué es lo que comió más **(nombre del niño)** entre las comidas principales (aparte del desayuno, almuerzo, la cena)? **[Marque una o más opciones.]** ☐ ☐ ☐

1. Sopita	7. Arroz	13. Café	19. Maíz en mote
2. Pan	8. Queso	14. Locro	20. Chicha de maíz
3. Huevo	9. Fruta	15. Fideo	21. Avena
4. Carne	10. Leche materna	16. Yuca	22. Té
5. Pollo	11. Leche de vaca	17. Ensalada	23. Verduras 25. Nada
6. Carne/Monte	12. Leche de tarro	18. Papa	24. Cocoa 26. Otro:__

45. Generalmente, ¿A quien sirve primero en la casa? ☐
    1. Los niños
    2. El padre
    3. Las personas mayores
    4. Otro: _____

46. Generalmente, ¿quienes comen con los niños? ☐
    1. La madre   4. La persona encargada de los niños
    2. El padre   5. La persona encargada de los niños y los padres
    3. La madre y el padre   6. Otro: _____

47. ¿Comen los niños de su propio plato?   SI = **1**   NO = **2**   ☐

F. PRACTICAS DE DAR PECHO
48. ¿Cuánto tiempo después del parto le dio al niño la mamá leche materna por primera vez? ☐
    1.   Durante la primera hora   3. No sabe

2.   Despúes de la primera hora   4. Nunca se lo dio al bebé   5. Otro: _____

49. ¿Hasta qué edad le dio sólo pecho o teta Ud./la mamá? ☐
    1.   1 mes   4. 3-4 meses   7. Más que 6 meses
    2.   1-2 meses   5. 4-5 meses   8. Sigue lactando
    3.   2-3 meses   6. 6 meses   9. Nunca   10.
    Otro:_____

50. ¿Está dando pecho ahora Ud./la mamá?   SI = 1   NO = 2; [Si es SI, vaya a #52] ☐

51. ¿A qué edad destetó al niño?   ☐ Años y ☐ ☐ Meses
                                           9   9 9 = No Sabe

52. ¿Por qué dejó de darle pecho Ud./la mamá?   *[Marque una o más opciones.]* ☐ ☐ ☐
    1. Falta de leche   9. El niño rechazo el pecho
    2. Problema en el pezón o pecho   10. Hizo daño
    3. La madre trabaja fuera de la casa   11. Por cuidar el cuerpo
    4. No se llenaba solo con la leche materna 12. Uso de métodos anticonceptivos
    5. El niño era grande   13. Por consejo de amigos o familiares
    6. El niño enfermo o débil   14. No sabe
    7. La madre enferma o débil   15. Otro: _____
    8. Estaba embarazada de nuevo

53. ¿A qué edad empezó a dar líquidos (aguitas, sopitas, jugos, mates, etc.)? ☐
            [Si es #5, vaya al 54]
    1. Antes de la 4 meses   3. Entre 6 -12 meses   5. Ninguno
    2. Entre 4-6 meses   4. Entre 1 - 2 años   6. No sabe   7. Otro: _____

54. ¿Qué clase de líquidos le dio? *[Marque una o más opciones.]* ☐ ☐ ☐
    1. Mate/te   5. Jugos   9. Avena con leche
    2. Clases de Agua   6. Café   10. Maizena
    3. Leche de tarro   7. Sopitas   11. Otro: _____
    4. Leche de vaca   8. Chicha de maíz

55. ¿Da/dio leche de tarro al niño?   SI = 1   NO = 2; [Si es NO, vaya a #56] ☐
56. ¿Porque da/dio leche de tarro al niño? *[Marque una o más opciones.]* ☐ ☐
    1. Falta de leche   4. La madre trabaja
    2. Tiene mas vitaminas   5. Con la leche materna no se llena
    3. El wawa no chupa la leche materna 6. Otro: _____

G. LA SALUD DEL NIÑO
57. ¿Está sano ahora *(nombre del niño)*?   SI = 1   NO = 2   NO SABE = 3 ☐

58. ¿En los últimos 2 semanas, tuvo *(nombre del niño)* diarrea, es decir 3 o más veces en
    un día?   SI = 1   NO = 2   NO SABE = 3; [Si es NO, vaya a #60] ☐

59. ¿Buscó ayuda?   SI = 1   NO = 2; [Si es NO, vaya a #60] ☐

60. ¿A quien fue primero? ☐
   1. Un RPS   3. Una enfermera   5. Un curandero
   2. Un auxiliar de salud   4. Un médico   6. A la farmacia   7. Otro:_____

61. En caso de que alguno de sus niños tuvo diarrea, ¿qué líquidos le ofreció? ☐ ☐ ☐
    [Marque una o más opciones.]
   1. Suero casero   6. Agua de plátano
   2. Sales de rehidratación oral   7. Sopitas
   3. Líquidos (mates, jugos, agua, café etc.)   8. Maizena
   4. Lactancia materna   9. Avena con leche   11. Agua de manzanilla
   5. Agua de arroz   10. Nada   12. Otro: _____

62. ¿La cantidad que le ofrece de líquido es? ☐
   1. Igual cantidad que antes   3. Menor cantidad que antes
   2. Mayor cantidad que antes

63. ¿En los últimos 2 semanas, tuvo *(nombre del niño)* IRA (tos, gripe, resfría, bronquitis, pulmones)?   SI = 1   NO = 2   NO SABE = 3; [Si es NO, vaya a #65] ☐

64. ¿Buscó ayuda?   SI = 1   NO = 2; [Si es NO, vaya a #65] ☐

65. ¿A quien fue primero? ☐
   1. Un RPS   3. Una enfermera   5. Un curandero
   2. Un auxiliar de salud   4. Un médico   6. A la farmacia   7. Otro:_____

66. En las dos últimas semanas, ¿tuvo *(nombre del niño)* fiebre?
                     SI = 1   NO = 2   NO SABE = 3; [Si es NO, vaya a #68] ☐

67. ¿Buscó ayuda?   SI = 1   NO = 2; [Si es NO, vaya a #68] ☐

68. ¿A quien fue primero? ☐
   1. Un RPS   3. Una enfermera   5. Un curandero
   2. Un auxiliar de salud   4. Un médico   6. A la farmacia   7. Otro:_____

H.   PARÁSITOS
69. ¿Ud. sabe que es la parasitosis (bichos)/gusanos?
                     SI = 1   NO = 2; [Si es NO, vaya a #73] ☐

70. ¿Cómo es la parasitosis? *[Marque una o más opciones.]* ☐ ☐ ☐
   1. Niño come tierra   5. Niño duerme mucho
   2. Niño con anemia   6. Suena los dientes mientras duerme
   3. Niño no quiere comer   7. Otro: _____
   4. Niño con barriga grande

71. ¿Por qué cree que los niños tienen bichos o gusanos en la barriga? *[Escriba la respuesta(s).]*

72. ¿Qué hace cuando su niño tiene parásitos (bichos)/gusanos? ☐ ☐ ☐
    [Marque una o más opciones.]
    1. Consulta con un médico   4. Consulta a un curandero
    2. Consulta con enfermera(o)   5. Consulta a la farmacia
    3. Consulta a los RPS   6. Otro: _____

73. ¿Ha recibido tratamiento *(nombre del niño)* para los bichos/gusanos?

    SI = 1   NO = 2   NO SABE = 3   ☐

I.   CONOCIMIENTO DEL HIERRO Y VITAMINA A:

74. ¿Conoce Ud. estas tabletitas? [*Muestra tabletitas de sulfato ferroso*]

    SI = 1   NO = 2   ☐

75. ¿Ha tomado Ud. estas tabletitas?   SI = 1   NO = 2   NO SABE = 3   ☐

76. ¿Ha recibido sus niños menores de 5 años jarabe/tabletas de sulfato ferroso?

    SI = 1   NO = 2   NO SABE = 3   ☐

77. ¿Conoce Ud. estas cápsulas? [*Muestra cápsulas de la vitamina A*]

    SI = 1   NO = 2   ☐

78. ¿Han recibido sus niños menores de 5 años vitamina A en las últimas seis meses?

    SI = 1   NO = 2   NO SABE = 3   ☐

79. [*Verificar con el Carnet de Salud Infantil*]
    SI RECIBIO VIT. A = 1   NO RECIBIO VIT A.= 2   NO TIENE CARNET = 3   ☐

80. ¿Ha tomado Ud. cápsulas de vitamina A?   SI = 1   NO = 2   NO SABE = 3   ☐

J.   PROBLEMAS DE LOS OJOS
81. ¿Tiene problemas/dificultad *(nombre del niño)* para ver durante el día?

    SI = 1   NO = 2   ☐

82. ¿Tiene problemas/dificultad *(nombre del niño)* para ver en la noche?

    SI = 1   NO = 2   ☐

83. ¿Tiene problemas/dificultad sus otros niños para ver en el día?

    SI = 1   NO = 2   ☐

84. ¿Tiene problemas/dificultad sus otros niños para ver en la noche?

    SI = 1   NO = 2   ☐

85. ¿Tiene Ud. problemas/dificultad para ver durante el día?

    SI = 1   NO = 2   ☐

86. ¿Tiene Ud. problemas/dificultad para ver en la noche?

    SI = 1   NO = 2   ☐

87. ¿En las últimas tres meses de su embarazo, ¿tuvo problemas con la vista?

K. FRECUENCIA DE CONSUMO DE ALIMENTOS:

"Ahora quisiera preguntarle algunas preguntas de lo que *(nombre del niño)* comió la semana pasada."

a. Durante la semana pasada, se le dio (ESPECIFIQUE COMIDA) en su comida al *(nombre del niño)*?
b. En los días que *(nombre del niño)* comió (COMIDA ESPECIFIQUE), comió una cantidad pequeña (P), mediana (M), o grande (G)?

NOMBRE DE COMIDA	NÚMERO DE DÍAS QUE LO COMIÓ								P = 1 M = 2 G = 3	
Alimentos Ricos en Vitamina A									[#]	[Cantidad]
88. Acelga	0	1	2	3	4	5	6	7	☐	☐___
89. Culandro (Cilandro)	0	1	2	3	4	5	6	7	☐	☐___
90. Cebolla entera	0	1	2	3	4	5	6	7	☐	☐___
91. Espinaca	0	1	2	3	4	5	6	7	☐	☐___
92. Hoja de apio	0	1	2	3	4	5	6	7	☐	☐___
93. Hígado	0	1	2	3	4	5	6	7	☐	☐___
94. Lechuga	0	1	2	3	4	5	6	7	☐	☐___
95. Mandarina	0	1	2	3	4	5	6	7	☐	☐___
96. Mantequilla	0	1	2	3	4	5	6	7	☐	☐___
97. Perejil	0	1	2	3	4	5	6	7	☐	☐___
98. Zapallo	0	1	2	3	4	5	6	7	☐	☐___
99. Huevo	0	1	2	3	4	5	6	7	☐	☐___
100. Zanahoria	0	1	2	3	4	5	6	7	☐	☐___
101. Quírquiña	0	1	2	3	4	5	6	7	☐	☐___
102. Atún en aceite	0	1	2	3	4	5	6	7	☐	☐___
103. Manga	0	1	2	3	4	5	6	7	☐	☐___
104. Melón	0	1	2	3	4	5	6	7	☐	☐___
105. Papaya	0	1	2	3	4	5	6	7	☐	☐___
106. Riñón	0	1	2	3	4	5	6	7	☐	☐___
107. Pescado	0	1	2	3	4	5	6	7	☐	☐___
Alimentos ricos en Hierro										
108. Chuño negro	0	1	2	3	4	5	6	7	☐	☐___
109. Cocoa	0	1	2	3	4	5	6	7	☐	☐___
110. Coca Chapare	0	1	2	3	4	5	6	7	☐	☐___
111. Fideo	0	1	2	3	4	5	6	7	☐	☐___
112. Haba	0	1	2	3	4	5	6	7	☐	☐___
113. Lenteja	0	1	2	3	4	5	6	7	☐	☐___
114. Morcilla	0	1	2	3	4	5	6	7	☐	☐___
115. Pasankalla	0	1	2	3	4	5	6	7	☐	☐___
116. Soya	0	1	2	3	4	5	6	7	☐	☐___

Miscelaneas

117. Sal	0	1	2	3	4	5	6	7 ☐	___	☐	___
118. Azucar	0	1	2	3	4	5	6	7 ☐	___	☐	___
119. Aceite	0	1	2	3	4	5	6	7 ☐	___	☐	___
120. Margarina	0	1	2	3	4	5	6	7 ☐	___	☐	___
121. Leche de tarro	0	1	2	3	4	5	6	7 ☐	___	☐	___

122. *[Si no come ninguno de estos alimentos]:* ¿Por qué no come ninguno de estos alimentos?
    1. Solo toma leche materna   4. No hay acceso a estos alimentos   ☐
    2. Solo toma leche de tarro   5. Otro: _____
    3. Solo toma una combinación de leche materna y leche de tarro

L. DATOS ANTROPOMÉTRICOS Y LABORATORIALES (HEMOGLOBINA, VITAMINA A y HESES)

Información del Niño

123. Peso (KG) _____ ⬜⬜.⬜⬜

124. Talla (CM) _____ ⬜⬜.⬜

125. Brazo (CM) _____ ⬜⬜.⬜

126. Hemoglobina (G/DL)_____ ⬜⬜.⬜

127. Vitamina A: _____   SI = 1   NO = 2   ⬜

128. Número de Muestra de Sangre* _____ ⬜⬜⬜

129. Número de Bolsa _____ ⬜

130. Concentración de Vitamina A en la MSS _____ ⬜⬜⬜.⬜

131. Número de Sangre Capilar* _____ ⬜⬜⬜

132. Número de Muestra de Heses* _____ (NIÑO) ⬜⬜⬜

133. Tipo de Parásitos   ⬜⬜⬜⬜

    1. Ascaris lumbricodes   5. Strongiloides Stercoralis
    2. Ameba histolítica   6. Himinolepsis Nana
    3. Ameba coli   7. Trichuris trichura
    4. Uncinarias   8. Giardia lamblia   9. Otro: _____

Información de la Madre:

134. Hemoglobina (G/DL)_____ ⬜⬜.⬜

135. Número de Muestra de Heses* _____ (MADRE) ⬜⬜⬜

136. Tipo de Parásitos   ⬜⬜⬜⬜

    1. Ascaris lumbricodes   5. Strongiloides Stercoralis
    2. Ameba histolítica   6. Himinolepsis Nana
    3. Ameba coli   7. Trichuris trichura
    4. Uncinarias   8. Giardia lamblia   9. Otro: _____

Nombre del Supervisor: _____

Firma del Supervisor: _____

Appendix 4- FOCUS GROUP GUIDE FOR MOTHERS

INVESTIGACION FORMATIVA
GUIA DE DISCUSION DE GRUPO FOCAL PARA LAS MADRES

A. COMMUNICACION/ESTRUCTURA EN LA CASA:
1. En su casas, quiene(s) cuida/está encargado(s) de los niños?
2. Quien es jefe de la familia?
3. Cuantos niños menores de 5 años de edad hay en sus casas?
4. Por cuanto tiempo vive aguí?

B. PRACTICAS DE ALIMENATACION
1. Cuantas horas después de sus partos empezaron a dar pecho al bebé?
2. Qué hacen las madres con la primera leche/"la corta"? Porque?
3. Están dando pecho ahora?
4. Cuantas veces al día dan pecho?
5. Hasta que edad dan pecho a un niño? Porqué?
6. Porque dejaron de dar pecho?
7. A que edad introducieron liquidos? Qué liquidos?
8. Han dado leche de tarro (e.g. Nestle) a sus niños? Porqué y a qué edad?
9. A que edad empezaron a dar comidas a sus hijos? Porqué?
10. Quien da comida a sus niños?
11. Cuantas veces al día dan comida a sus niños?
12. Habitualmente qué dan de comer a sus hijos para:
    a. el desayuno?
    b. el almuerzo?
    c. la cena?
13. Qué alimentos le da a su niño entre las comidas principales (aparte del desayuno, almuerzo, la cena)?
14. Comen sus nino de sus propios platos o comparten con otros?
15. Qué hacen cuando sus niños no quieren comer?

C. ALIMENTACION EN LAS DIFERENTES ETAPAS DE LA VIDA
1. Qué es comida apropriada para:
    a. Una wawa hasta 1 año? Porqué?
    b. Un wawa de 1-2 años? Porqué?
    c. Un niño de 2-5 años? Porqué?
    d. Una mujer embarazada? Porqué?
    e. Una mujer que está dando pecho? Porqué?
    f. Una mujer que no está dando pecho? Porqué?
2. Que problemas tienen alimentando a sus niños cuando están sanitos?

D. LA DESNUTRICION
1. Conoce/sabe que es la desnutrición? Qué es? Explique.
2. Cuantos tipos de desnutrición hay?
3. Conoce/sabe las causas de la desnutrición?
E. COMIDAS PARA UN NINO ENFERMO
1. Comó se cuida a un nino enfermo con:
    a. Diarrhea? Porqué?

2. Qué tipo de comida le da a un nino con:
   a. Diarrhea? Porqué?
3. Qué comidas especiales le da a su niño enfermo?

F. TABU ALIMENTARIA
1. Qué comidas son malas para:
   a. Una wawa hasta 1 año? Porqué?
   b. Un wawa de 1-2 años? Porqué?
   c. Un niño de 2-5 años? Porqué?
   d. Una mujer embarazada? Porqué?
   e. Una mujer que está dando pecho? Porqué?
   f. Una mujer que no está dando pecho? Porqué?
2. Qué comidas son malos para el niño enfermo (e.g. diarrhea, IDA/EDA)?

G. COMIDA
1. De donde compra/consigue su comida?
2. Quien prepara la comida en sus casas?
3. Cuantas veces por día comen uds. (las madres)?
4. Qué tipo de comidas comen?
5. Hay variedad en las comidas/alimentos que comen durante el año (según epocas distinctas, por ejemplo)?
6. Hay comidas especiales para los feriados/las fiestas/los cumpleaños?

H. VITAMINAS
1. Qué son las vitaminas?
2. Qué vitaminas conocen?
3. Donde se las encuentran?
4. Para que sirven?
5. Quien las necesitan?

I. VITAMINA A
1. Que saben y para que sirve la vitamina A? [Muestra capsulas de vitamina A]
2. Donde/Comó se consigue la vitamina A?
3. Han recibido vitamina A sus niños menores de 5 años? Cuando y donde?
4. Qué comidas tienen vitamina A? Cuales?
5. Pasa algo si no tiene vitamina A en el cuerpo? Qué?
6. Qué se podría hacer aguí para que un niño menor de 5 años tuviera mas vitamina A en su cuerpo?

J. HIERRO
1. Conocen la anemia? Qué es?
2. Qué pasa cuando alguien tiene anemia?
3. Comó sabe que un niño tiene anemia?
4. Comó sabe que una mujer tiene anemia?
5. Sus niños menores de 5 años han recibido jarabe/tabletas de sulfato ferroso? Cuando y donde? [Muestra jarabe/tabletas de sulfato ferroso]
6. Que saben y para que sirve el sulfato ferroso?
7. Qué comidas tienen sulfato ferroso? Cuales?
7. Pasa algo si no tiene hierro/sulfato ferroso en el cuerpo? Qué?

8. Qué se podria hacer aguí para que un niño menor de 5 años tuviera mas hierro/sulfato ferroso en su cuerpo?

K. PROBLEMAS CON LOS OJOS
1. Hay algunas de uds. que tienen dificultad/problemas para ver en la noche?
2. Conocen niños que tienen dificultad/problemas para ver en la noche?
3. Algunas de uds. tuvieron problemas con la vista en la fase final de su embarazo?

L. SANIMIENTO BASICO
1. De donde recogen el aqua que usan para tomar y cocinar?
2. Donde van al baño?

INVESTIGACION FORMATIVA
GUIA DE DISCUSION DE GRUPO FOCAL PARA LOS RPSs

A. CREENCIAS COMUNES SOBRE LAS ENFERMEDADES EN LAS COMUNIDADES
1. De qué enferman más los niños en su comunidad?
2. Qué enfermedades de los niños causan mucha tristeza y preocupación a los padres?
3. Porqué creen que les da diarrea a los niños?
4. Porqué creen que los niños tienen bichos o gusanos?

B. PRACTICAS SOBRE LA SALUD EN LAS COMUNIDADES
1. Qué hacen los padres cuando sus niños tienen:
   a. Diarrea? Porqué?
   b. Resfrios/Neumonia? Porqué?
   c. Fiebre? Porqué?
2. Qué hacen uds. cuando un niño está enfermo con:
   a. Diarrea? Porqué?
   b. Resfrios/pneumonia? Porqué?
   c. Fiebre? Porqué?
3. Piensan que las vacunas son buenas para los niños? Porqué?
4. Que hacen los padres para que sus niños no se enfermen?
5. Qué opinan del personel de salud que hay en los puestos de salud, las hospitales, etc.?

C. COMIDAS PARA UN NINO ENFERMO
1. Qué tipo de comida le da a un nino con:
   a. Diarrhea? Porqué?
   b. Resfrios/pneumonia? Porqué?
   c. Fiebre? Porqué?
2. Hay comidas especiales que se da a un niño enfermo?

D. ALIMENTACION EN LAS DIFERENTES ETAPAS DE LA VIDA
1. Qué comidas debe comer naturalmente:
   a. Una wawa hasta 1 año? Porqué?
   b. Un wawa de 1-2 años? Porqué?
   c. Un niño de 2-5 años? Porqué?
   d. Una mujer embarazada? Porqué?
   e. Una mujer que está dando pecho? Porqué?
   f. Una mujer que no está dando pecho? Porqué?
2. Que problemas tienen los padres en sus comunidades alimentando a sus niños cuando están sanitos?

E. LA DESNUTRICION
1. Conoce que es la desnutrición? Qué es? Explique.
2. Cuantos tipos de desnutrición hay?
3. Conoce/sabe las causas de la desnutrición?

F. TABU ALIMENTARIA
1. Qué comidas son malas para:
   a. Una wawa hasta 1 año? Porqué?
   b. Un wawa de 1-2 años? Porqué?
   c. Un niño de 2-5 años? Porqué?
   d. Una mujer embarazada? Porqué?
   e. Una mujer que está dando pecho? Porqué?
   f. Una mujer que no está dando pecho? Porqué?

G. VITAMINAS
1. Qué son las vitaminas?
2. Qué vitaminas conocen?
3. Donde se las encuentran?
4. Para que sirven?
5. Quien las necesitan?

H. VITAMINA A
1. Que saben y para que sirve la vitamina A? [Muestra capsulas de vitamina A]
2. Donde/Comó se consigue la vitamina A?
3. Han recibido vitamina A los niños menores de 5 años en su comunidad? Cuando y donde?
4. Qué comidas tienen vitamina A?
5. Pasa algo si no tiene vitamina A en el cuerpo? Qué?
6. Qué se podría hacer aguí para que un niño menor de 5 años tuviera más vitamina
   A en su cuerpo?

I. HIERRO
1. Conocen la anemia? Qué es?
2. Qué pasa cuando alguien tiene anemia?
3. Comó sabe que un niño tiene anemia?
4. Comó sabe que una mujer tiene anemia?
5. Los niños menores de 5 años en su comunidad han recibido jarabe/tabletas de sulfato ferroso?
   Cuando y donde? [Muestra jarabe/tabletas de sulfato ferroso]
6. Que saben y para que sirve el sulfato ferroso?
7. Qué comidas tienen sulfato ferroso? Cuales?
8. Pasa algo si no tiene hierro/sulfato ferroso en el cuerpo? Qué?
9. Qué se podria hacer aguí para que un niño menor de 5 años tuviera mas hierro/sulfato ferroso en
   su cuerpo?

J. PROBLEMAS CON LOS OJOS
1. Hay algunas de uds. que tienen dificultad/problemas para ver en la noche?
2. Conocen niños que tienen dificultad/problemas para ver en la noche?
3. Conocen algunas mujeres que tuvieron problemas con la vista en la fase final de su embarazo?
4. Algunas de uds. tuvieron problemas con la vista en la fase final de su embarazo?

Appendix 6- FOCUS GROUP GUIDE FOR HEALTH PERSONNEL

INVESTIGACION FORMATIVA
GUIA DE DISCUSION DE GRUPO FOCAL PARA PERSONEL DE SALUD

A. CREENCIAS COMUNES SOBRE LAS ENFERMEDADES EN LAS COMUNIDADES
1. De qué enferman más los niños en su comunidad?
2. Qué enfermedades de los niños causan mucha tristeza y preocupación a los padres?
3. Porqué creen que les da diarrea a los niños?
4. Porqué creen que los niños tienen bichos o gusanos?

B. PRACTICAS SOBRE LA SALUD EN LAS COMUNIDADES
1. Qué hacen uds. cuando sus niños tienen:
   a. Diarrea? Porqué?
   b. Resfrios/Neumonia? Porqué?
   c. Fiebre? Porqué?
2. Piensan que las vacunas son buenas para los niños? Porqué?
3. Que pueden hacen los padres para que sus niños no se enfermen?
4. Qué opinan del los padres de familia de su comunidad?

C. COMIDAS PARA UN NINO ENFERMO
1. Según ud. qué tipo de comida le da a un nino con:
   a. Diarrhea? Porqué?
   b. Resfrios/pneumonia? Porqué?
   c. Fiebre? Porqué?
2. Hay comidas especiales que se da a un niño enfermo?

D. ALIMENTACION EN LAS DIFERENTES ETAPAS DE LA VIDA
1. Qué comidas debe comer naturalmente:
   a. Una wawa hasta 1 año? Porqué?
   b. Un wawa de 1-2 años? Porqué?
   c. Un niño de 2-5 años? Porqué?
   d. Una mujer embarazada? Porqué?
   e. Una mujer que está dando pecho? Porqué?
   f. Una mujer que no está dando pecho? Porqué?
2. Que problemas tienen los padres en sus comunidades alimentando a sus niños cuando están sanitos?

E. LA DESNUTRICION
1. Qué es la desnutrición?
2. Cuantos tipos de desnutrición hay?
3. Qué son las causas de la desnutrición?

E. TABU ALIMENTARIA
1. Qué comidas son malas para:
   a. Una wawa hasta 1 año? Porqué?
   b. Un wawa de 1-2 años? Porqué?
   c. Un niño de 2-5 años? Porqué?
   d. Una mujer embarazada? Porqué?

    e.   Una mujer que está dando pecho? Porqué?

    f.   Una mujer que no está dando pecho? Porqué?

F. VITAMINAS
1. Qué son las vitaminas?
2. Qué vitaminas conocen?
3. Donde se las encuentran?
4. Para que sirven?
5. Quien las necesitan?

G. VITAMINA A
1. Que saben y para que sirve la vitamina A?
2. Donde/Comó se consigue la vitamina A?
3. Han recibido vitamina A los niños menores de 5 años en sus comunidades? Cuando y donde?
4. Qué comidas tienen vitamina A? Cuales?
5. Pasa algo si no tiene vitamina A en el cuerpo? Qué?
6. Qué se podría hacer aguí para que un niño menor de 5 años tuviera mas vitamina A en su cuerpo?

H. HIERRO
1. Conocen la anemia? Qué es?
2. Qué pasa cuando alguien tiene anemia?
3. Comó sabe que un niño tiene anemia?
4. Comó sabe que una mujer tiene anemia?
5. Los niños menores de 5 años en sus comunidades han recibido jarabe/tabletas de sulfato ferroso? Cuando y donde?
6. Que saben y para que sirve el sulfato ferroso?
7. Qué comidas tienen sulfato ferroso? Cuales?
8. Pasa algo si no tiene hierro/sulfato ferroso en el cuerpo? Qué?
9. Qué se podria hacer aguí para que un niño menor de 5 años tuviera mas hierro/sulfato ferroso en su cuerpo?

I. PROBLEMAS CON LOS OJOS
1. Hay algunas personas en su comunidad que tienen dificultad/problemas para ver en la noche?
2. Conocen niños que tienen dificultad/problemas para ver en la noche?
3. Conocen mujeres que tuvieron problemas con la vista en la fase final de su embarazo?
4. Algunas de uds. tuvieron problemas con la vista en la fase final de su embarazo?

APPENDIX 7- TEAM TRAINING SCHEDULE

Cronograma de la Encuestra Nutricional, Provincia de Ichilo 3-7 Abril 2001

Día 1: 3 de Abril (Martes)

8:30-9:00   Introdución y Antecedentes (Gwen O´Donnell, Facilitadora)
  i.   Todos se presentan
  ii.   Horario para la semana
  iii. Horario para la mes
  iv.   El pago
  v.   Comida; una persona para preparar el desayuno, almuerzo en papel aluminio, y la cena; (el propósito de los viaticos)

9:00-9:45   La Encuesta (Gwen O´Donnell, Facilitadora)
  i.   El propósito de la encuestra: falta de datos, información fundamental para diseñar y medir el efecto de una(s) intervención
  ii.   Opciones para la intervención(es): suplementación, fortificación, diversificación de la dieta, el Modelo Hearth, etc.
  iii. Los pasos mayores de una encuesta: formando el cuestionario, probando y traduciendo el cuestionario, capacitando los equipos, estableciendo los logisticos, informando los encargados de las comunidades, obteniendo consentimiento informado de las madres, entrevistando madres, sacando muestras de sangre de niños y madres, haciendo medidas antropometricas de los niños, sacando heses de los niños, entrando los datos en un base de datos, analizando los datos
  iv.   Composición de los equipos: el rol y la responsibilidad de cada persona
  v.   La importancia de la alta calidad y buena supervisión/colaboración de todos
  vi.   Resumen de los datos a ser recogidas y las medidas para recogerlos.

9:45-10:00   La Nutrición (Gwen O´Donnell, Facilitadora)
  i.   Información general sobre la nutrición
  ii. La desnutrición y las consecuencias: falta de crecimiento de los niños, etc.
  iii. Información sobre la vitamina A: funciones, la carencia de VA y sus consecuencias, relación con morbilidad y mortalidad
  iv. Información sobre el hierro: funciones, la carencia de hierro y sus consecuencias, relación con morbilidad y mortalidad

10:00-10:15   Etiqueta en las Comunidades (Luiz Rocha, Facilitador)
  i.   Informar a las autoridades locales del propósito del estudio con los objetivos por carta
  ii.   Averiguar si hay alguien quien estaría disponible para acompañarnos en la comunidad.
  iii. Aceptar la comida ofrecida, etc.

10:15-10:30   Descanso

10:30-11:30   El Cuestionario (Gwen O´Donnell, Facilitadora)

i.	La importancia del cuestionario
ii.	El proceso de crear el cuestionario: entrevistas individuales a fondo; 4 grupos focales (8-10 personas) en cada área (madres urbanas, madres rurales, RPSs, personel de salud)
iii.	Revisar el Cuestionario
iv.	Probar el cuestionario en la prueba piloto en la comunidad

11:30-12:30 Parásitos (Dra. Julia Torrico & Agosto Hidalgo, Facilitadores)

i.	Información general sobre los parásitos
ii.	Porque es importante obtener información de los parásitos?
iii.	La metodologia para pedir y recoger heses
iv.	Los logisticos

12:30-12:45 Preparación de Los Insumos (Agosto Hidalgo, Facilitador)

12:00-1:50 Almuerzo

2:00-5:00 Medidas Antropometricas (Miriam Milluni y Gwen O´Donnell, Facilitadoras)

i.	Antecedentes de la antropometría (e.g. el que, quien, como, porque para la antropmetria)
ii.	El significado de talla para la edad, peso para la talla, peso para la edad
iii.	Pesar
	- la balanza: como funciona (e.g. la necesidad de usar tablas de madera; como se la enciende y apaga; la calibración; como la cuida)
	- el método de pesar a las madres
	- el método de pesar a los niños
	- demonstración y todos practican los métodos
iv.	Medir la talla
	- el "Shorr Board": como funciona
	- el método de medir la talla de niños menores de dos años
	- el método de medir la talla de niños mayores de dos años
	- demonstración y todos practican
v.	Medir el brazo
	- la cinta de brazo: el método de medir el tamaño del brazo
	- demonstración y todos practican

5:00-5:15 Descanso

5:15-6:30 Repaso del Día- Presentaciones de 10 minutos

i.	Propósito de la encuesta - Irene
ii.	Importancia de buena nutrición - Luiz
iii.	Vitamina A – Mery Elena
iv.	Hierro- Claudia
v.	Cuestionario- Ramiro
vi.	Parásitos- Abrosio
vii.	Medir el peso- Justina
viii.	Medir la talla- Jernan
ix.	Medir el brazo- Abraham

8:30-12:00   **Metodología para el Estudio (Femida Gutierrez, Facilitadora)**
       i.   Metodolgía de selección de las casas
       ii.   Metodolgía de selección de los niños

12:00-2:00   **Almuerzo**

2:00-6:30   **Metodología para el Estudio (Femida Gutierrez, Facilitadora)**
       i.   Practica de metodología

Día 3: 5 de Abril (Jueves)

8:30-12:00   **"Blood Spots" para Medir la Carencia de Vitamina A (Howard Jackson, Facilitador)**
       i.   Antecedentes del "blood spot" (que, quien, como, porque)
       ii.   Descripción y demonstración del protocolo para hacer los blood spots
       iii.   Todos practican

2:00-6:30   **HemoCue para Medir la Carencia de Hierro (Gwen O'Donnell, Facilitadora)**
       i.   Antecedentes (e.g. el que, quien, como, porque)
       ii.   Descripción y demonstración del protocolo para el test de HemoCue
       iii.   Todos practican

Día 4: 6 de Abril (Viernes)

8:30-6:30   **Practicar en el Campo (en una comundidad fuera de los conglomerados)**

Día 5: 7 de Abril (Sábado)

8:30-12:30   **Practicar en el Campo (en una comundidad fuera de los conglomerados)**

12:30-2:20   **Almuerzo**

2:30-5:30   **Discussión de Las Dificultades y Problemas No Anticipados y Encontrados (Gwen O'Donnell, Facilitadora)**

APPENDIX 8- SUPERVISOR CHECK LIST

Lista de Chequeo Para Los Supervisores

Equipo:_____

Fecha: _____

Firma del Supervisor: _____

A. Chequeo del Hemocue

Serial No. (de la Hemocue): _____

Número de la Cuveta de Control _____+- 0.3g/dl

Número de Prueba: _____

Observaciones: _____

_____

A. Instrucciones/Guias:
1. Vitamina A: ¿Qué es la vitamina A?¨ ☐
2. Collectión de Vit. A: ¨Manual de Campo Para la Collección de la Mancha de Sangre para el Analisis del Contenido de la Vitamina A.¨ ☐
3. Instrucciones para el uso del Hemocue ☐
4. Instruciones para el uso de la Balanza ☐
5. 1 lamina a colores de la Vitamina A ☐
6. 10 Foletos de la Encuesta Nutricional ☐
7. Una carnet de salud infantil ☐
8. Nuevas Encuestas ☐

B. Materiales para Muestras de Sangre Seca:
1. 15 lancetas (al menos) ☐
2. 2 Fuentes de algodón (uno seco, otro con alcohol) ☐
3. Caja de guantes desechables ☐
4. 1 Cinta adhesiva ☐
5. 1 Frasco de alcohol ☐
6. Kleenex ☐
7. La maleta negra (para guadar las tarjetas) ☐
8. Tarjetas en un bolsa con absorbente ☐
9. Dos bolsas de plastico para las tarjetas con absorbentes ☐

C. Materiales para Muestras de Sangre Capilar:
1. 17 Microtubos ☐
2. Una conservadora de plastofor ☐
3. Perritos congelados!

D. Materiales para Muestra de Hemoglobina
1. Hemocue ☐
2. Lancetas ☐
3. 1 Frasco de cuvetas (c/tapa roja) con bastantes cuvetas ☐
4. 1 Jugette de Hemoglobina (¨Hemoglobina Man¨) ☐
5. 5 Baterias extras (tamaño AA) ☐

E. Materiales para Muestra de Heses
1. 4 Vasitos para heses ☐
2. 4 palitos ☐
3. Un rollo de tela adhesiva ☐
4. Una conservadora de plastofor ☐
5. Perritos congelados!

F. Materiales para Medidas Antropolometricas
1. Balanza ☐
2. Cintas metrica (Una grande; una para medir PB en un frasco) ☐
3. 1 tallimetro ☐
4. 4 batterias (de tamaño AA)* ☐
5. Tablera de madera

G. Miscelaneas
1. 1 Cuaderno espiral ☐
2. 3 Lapices ☐
3. 4 Boligrafos (dos rojos, dos permanentes) ☐
4. 1 Caja de crayons ☐
5. 1 Frasco de Vitamina A ☐
6. Una botella de vidrio ☐
7. Tijeras ☐
8. Una engrampadora ☐
9. Bolsa negra para la basura ☐
10. Botella vacia para meter las lancetas usadas ☐
11. 1 hoja de esponja ☐
12. Dulces ☐
13. Stickers :-) ☐

*Para el equipo de Yapacani: 2 de 9 voltas

CRAFT TECHNOLOGIES, INC.

Impacting the World

To: International Eye Foundation
From: Craft Technologies, Inc.
Subject: Summary of Bolivia DBS Retinol Analysis

A total of approximately 600 dried blood spot (DBS) samples collected in the field in Bolivia were received in a single shipment. All samples were removed from the shipping containers and immediately placed in –70 C freezers until cataloged and analyzed. The shipment also contained 67 serum samples that had matching DBS samples. DBS cards were packaged in zip-lock freezer bags with desiccant and moisture indicator cards

A 1/4 inch punch from each dried blood spot was eluted from the DBS card in aqueous buffer containing ascorbic acid as an antioxidant. The retinol:RBP complex was dissociated through the addition of acetonitrile containing an internal standard used for quantitation. The retinol was extracted from the aqueous phase into hexane. The hexane extract was measured directly using normal-phase HPLC with UV detection at 300 and 325 nm. The HPLC column was NH2 bonded to silica and the mobile phase was 1% isopropyl alcohol in hexane (Craft, J Nutr. 2001). The equipment was calibrated using neat solutions of retinol and the internal standard, tocol. Plasma and DBS quality control materials were included with each set of samples.

Matching serum samples obtained for a subset of the DBS samples were extracted and analyzed as previously described (Craft et al. J. Nutr. 2000). Briefly, samples were diluted with water, precipitated with ethanol containing tocol as an internal standard, and extracted with hexane. The hexane was evaporated under nitrogen and the residue dissolved in ethyl acetate and diluted with mobile phase. The samples were separated using reversed-phase HPLC with UV detection. The column was a Spherisorb ODS2 and the mobile phase was a mixture of 83% acetonitrile, 13% dioxane, and 4% methanol containing triethylamine and ammonium acetate. QC plasma and NIST control materials were analyzed with the plasma samples.

The correlation of DBS retinol with plasma retinol is provided in the spreadsheet, 2001-167 serum vs DBS. See Figure 1 for a graphical representation. Many of the blood samples were not adequately centrifuged to separate the serum from the erythrocytes and hemolysis was evident. Samples volume on several blood samples was inadequate. In addition, many of the DBS samples were not good quality. Halos formed around a significant portion of the DBS. We are uncertain how this occurs and what effect it has on the retinol measurement. Our hypothesis is that the serum component may migrate toward the periphery and the erythrocytes remain in the center of the DBS. If so, retinol would be lower in the center of the DBS, where we punch our sample. This phenomena may be the result of high humidity on the DBS cards. Since the correlation for this set of samples was low, the slope was not near to 1.0 and the intercept was relatively large; we calculated the recovery of retinol using control DBS of known retinol concentration. The recovery factor from the control DBS samples was applied to all the samples collected in Bolivia.

The results of retinol analysis are provided in electronic format and in the attached report, 2001-167 DBS only. The results are expressed with two different units (µg/mL and µmol/L). The values reported are equivalent to serum retinol concentrations. The frequency of samples below specified cut points is used to identify public health (PH) problems. These values are provided in several publications including WHO 1996, "Indicators for assessing vitamin A deficiency and their application in monitoring and evaluating intervention programmes." In children between 6-71mo of age, 0.7 µmol/L is the cut point used. If the frequency of subjects below 0.7 µmol/L is 2-10%, there is a mild PH problem; if 10-20% the problem is moderate; if >20% the problem is severe. In adults, values <1.05 µmol/L represent marginal vitamin A status, <0.7 µmol/L is moderate deficiency, and <0.35 µmol/L is severely deficient.

Retinol is transported in the blood associated with Retinol Binding Protein (RBP). Since RBP is a negative acute phase protein, retinol will decrease in the blood in response to infection and inflammation. The observation of halos is evidence of a possible gradient of retinol across the DBS. These factors should be considered when interpreting the frequency and severity of vitamin A deficiency since both would tend to reduce the measured vitamin A. We will test a subset of DBS samples and normalize for sodium to calculate the volume of serum in each DBS. This will allow us to determine if the halo or blood sampling influenced the DBS retinol.

This report and the electronic data files fulfill our commitments on this project with International Eye Foundation. We will continue to assist IEF if further clarification of the data is necessary.

Figure 1. Serum retinol versus adjusted dried blood spot retinol in samples from Bolivia measured by HPLC.
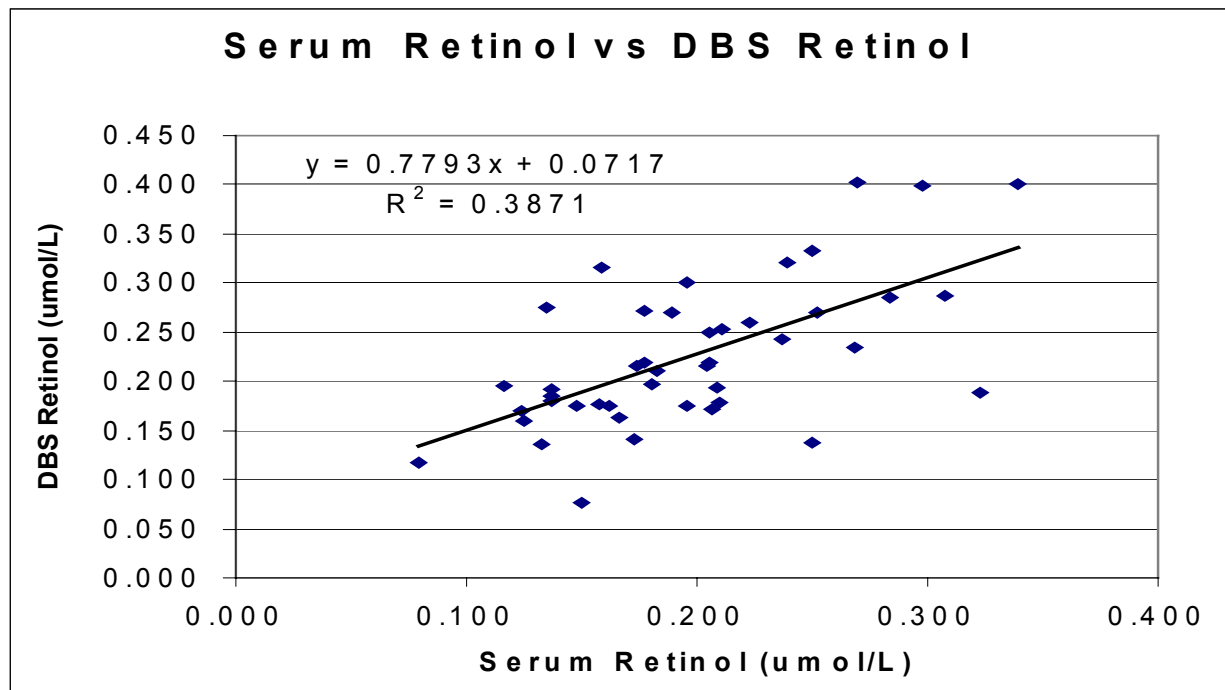
International Eye Foundation Retinol Analysis

Work Performed for Gwen O'Donnell
Analysis Date: August 6 - September 14, 2001

Sample #	Serum Retinol	Serum Quality	DBS Retinol	DBS Quality	
	µg/mL				
306	0.196		0.175		
307	0.162		0.175		
308	0.205		0.216		
329	0.268		0.234		
330	0.307		0.286		
349	0.205		0.249		
352	0.173		0.141		
353	0.166		0.163		
354	0.323		0.189		
355	0.250		0.333		
356	0.284		0.285		
359	0.237		0.242		
360	0.207		0.171		
365	0.250		0.138		
366	0.151		0.076		
367	0.209		0.194		
371	0.205		0.220		
372	0.133		0.136		
374	0.137		0.192		
375	0.157		0.176		
491	0.177		0.272		
521	0.125		0.160		
523	0.252		0.270		
524	0.183		0.210		
525	0.124		0.170		
526	0.180		0.197		
542	0.177		0.219		
543	0.270		0.402		
544	0.135		0.276		
545	0.339		0.401		
546	0.159		0.316		
547	0.211		0.253		
548	0.298		0.400		
550	0.195		0.300		
552	0.137		0.186		
555	0.239		0.320		
556	0.117		0.196		
559	0.173		0.215		

570	0.080			0.118	
571	0.148			0.175	
572	0.137			0.179	
574	0.209			0.178	
591	0.223			0.260	
596	0.189			0.271	
Mean	0.198			0.226	
298	0.215	hem		0.095	halo
320	0.290	hem		0.190	halo
358	0.193	hem		0.271	halo
297	0.332	hem		0.210	
350	0.312	hem		0.242	
373	0.275	hem		0.364	
551	0.246	hem, gel		0.392	
361	0.137	lo vol		0.183	
369	0.336	lo vol		0.132	
370	0.315	lo vol		0.175	
240	0.349			0.188	halo
541	0.364			0.226	halo
573	0.141			0.212	halo
Mean	0.270			0.222	

excluded from the figure due to questionable quality